11 MARCH 1954 NINEPENCE

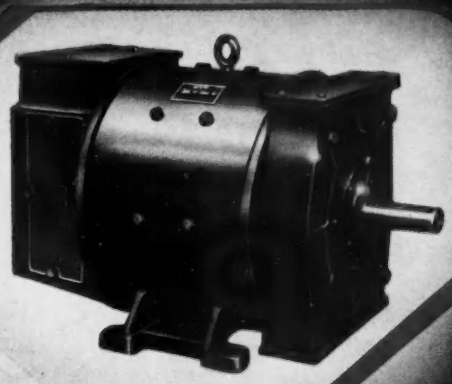
ELECTRICAL TIMES

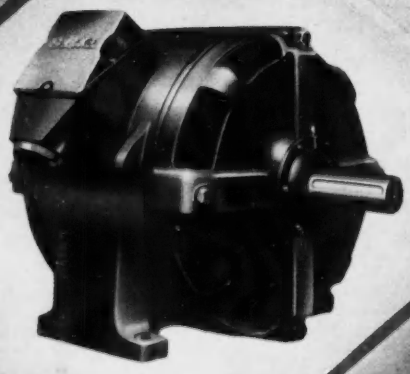
They bear the name

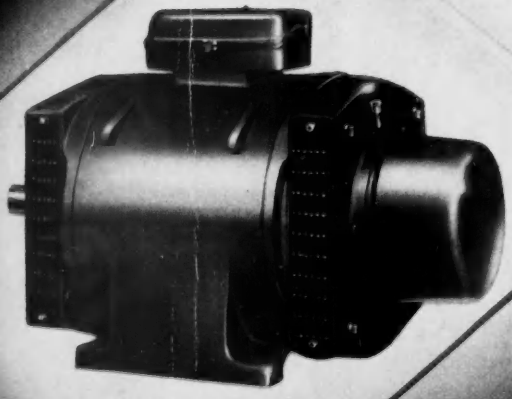
G.E.C.

. . . a name for

RELIABILITY







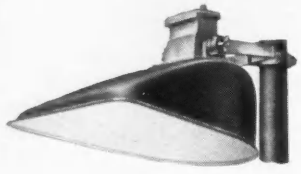
G.E.C.

STANDARD INDUSTRIAL MOTORS

Simplex lighting equipment

Simplex Dispersive Reflectors illuminate this joinery workshop

Like so many up-to-the-minute firms, Messrs. John Sadd & Sons Ltd., specify Simplex lighting equipment for their joinery works. Why? Because Simplex equipment is as effective as it is reliable. Here are two examples from the Simplex range



SIMPLEX REFLECTO-FLOODS—

perhaps the most widely used open-type floodlight made in Britain. Two types: GENERAL FLOOD for railway sidings, car parks, football grounds; BEAM TYPE for service stations, point-duty policemen, etc. Many types of mounting. For use with Mercury discharge (125—250 400W) or G.S. (300/1500W) lamps. Prices from £10.10.8 according to type

SIMPLEX 'CORRILUX'

—one of several patterns of weatherproof and dust-tight bulkhead fittings. This robustly constructed fitting is for surface or semi-recessed mounting and it can accommodate all G.S. lamps up to 100-watts. And the price is only 27/- each

GOOD ADVICE—FREE

Our Advisory Centres are able to give sound, practical, money-saving advice on all your lighting problems. This service is entirely free. Write to the Lighting Advisory Centre at Creda Works, Blythe Bridge, Staffs., or to 217/9, Tottenham Court Road, London, W1

lighting equipment from the house of **Simplex**

Simplex Electric Co. Limited, Creda Works, Blythe Bridge, Staffs, & Branches

A COMPANY

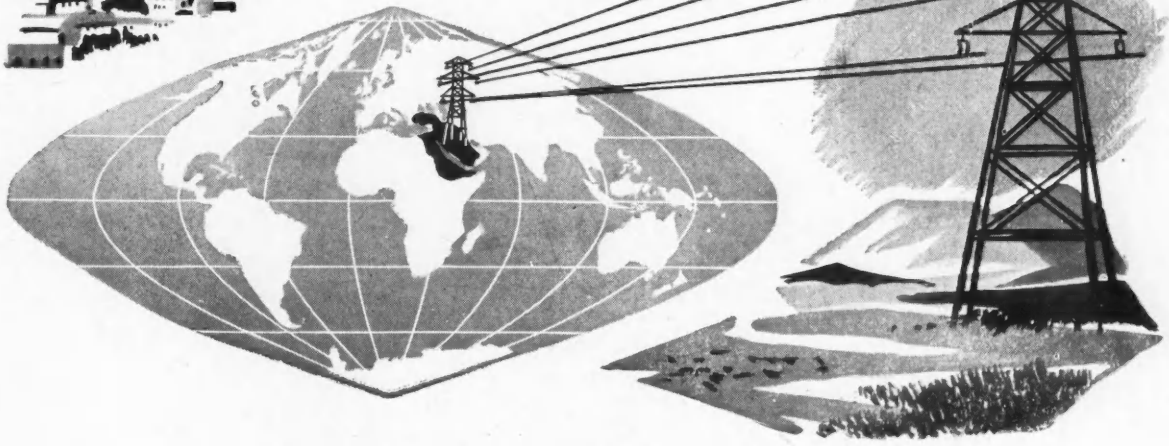
AWCO

Aluminium conductor spans the world

Tapping the world's natural resources would be a completely fruitless endeavour were there no means to carry power to the point at which it can most profitably be employed. Aluminium conductors of all types enable this to be done in the most economical manner over any distance with a minimum energy loss.

The Near East

this area of the globe — traditionally the cradle of Western civilisation — has of recent years, with the development of air transport and of the oil industry, attained great importance as a stepping stone in world communication and as a storehouse of the world's fuel supplies.



ALUMINIUM WIRE & CABLE CO. LTD.

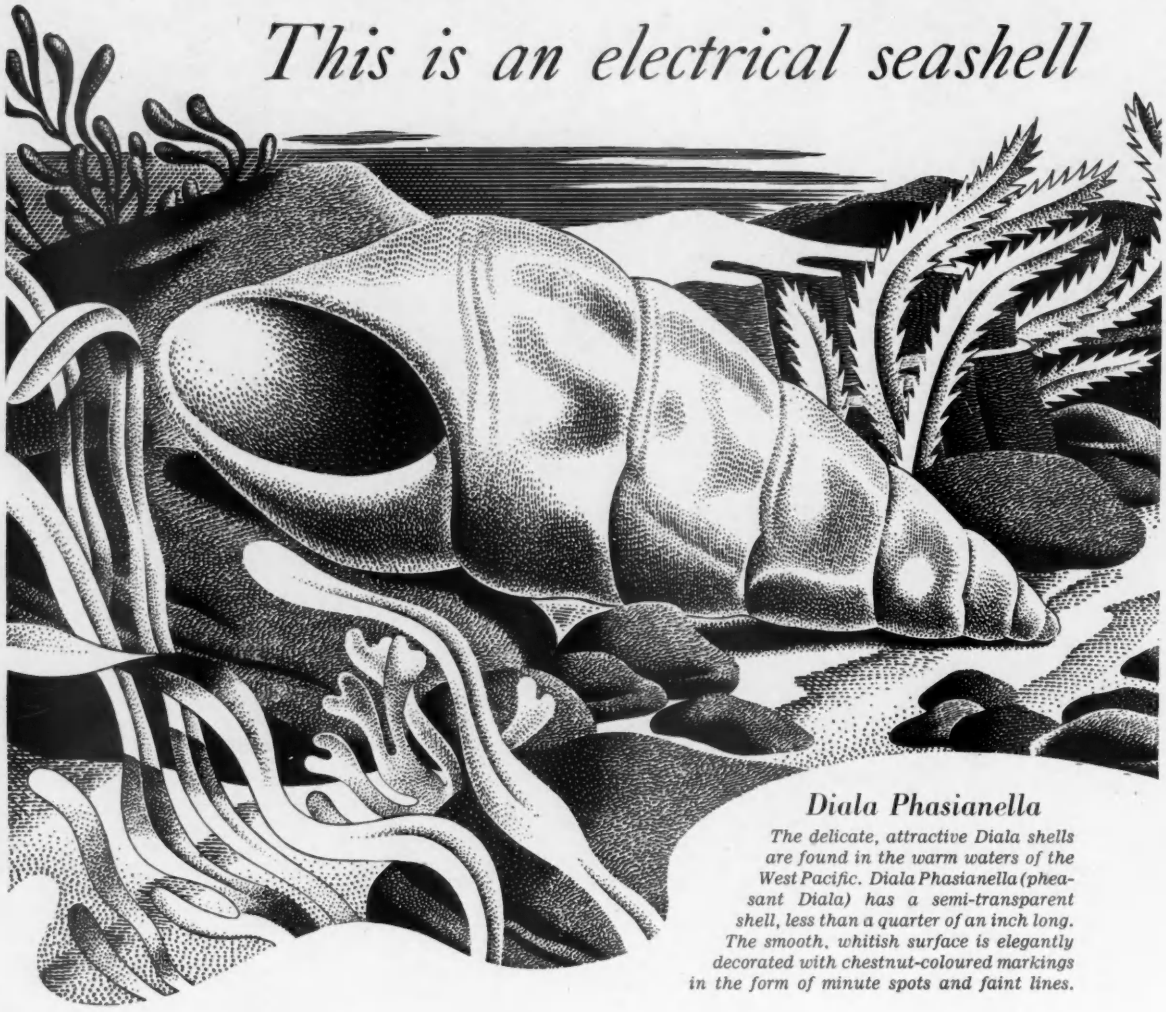
Britain's Largest Manufacturers of Aluminium Wire and Conductors

HEAD OFFICE AND WORKS: PORT TENNANT, SWANSEA, GLAMORGAN

SALES OFFICE: 30 CHARLES II STREET, ST. JAMES'S SQUARE, LONDON, S.W.1

Telephone :—TRAFALGAR 6441

This is an electrical seashell



Diala Phasianella

The delicate, attractive Diala shells are found in the warm waters of the West Pacific. Diala Phasianella (pheasant Diala) has a semi-transparent shell, less than a quarter of an inch long. The smooth, whitish surface is elegantly decorated with chestnut-coloured markings in the form of minute spots and faint lines.

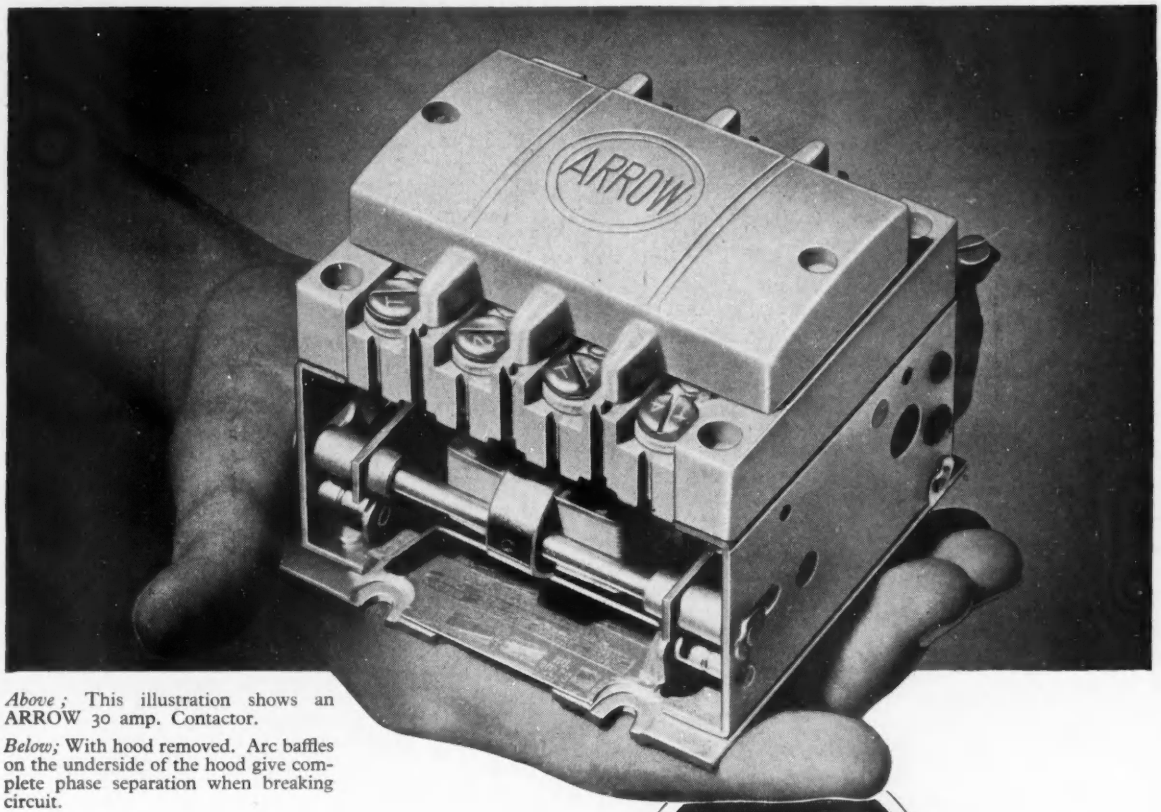
Shell Diala Oils are specially designed for transformers, oil-filled switchgear and capacitors, and for general insulating and dielectric purposes. Shell Diala Oil B complies with British Standard Specification 148/1951.

Shell Diala Oils

SHELL

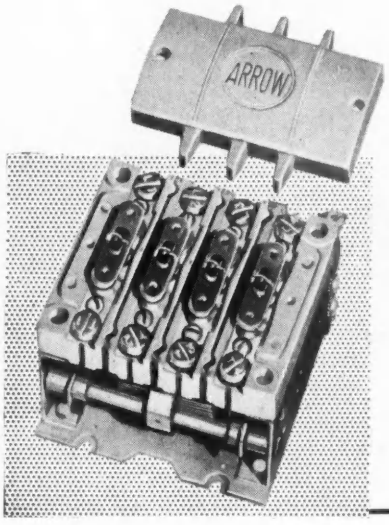
LEADERSHIP IN LUBRICATION

THE SMALLEST PANEL-MOUNTING CONTACTOR ON THE MARKET!



Above ; This illustration shows an ARROW 30 amp. Contactor.

Below; With hood removed. Arc baffles on the underside of the hood give complete phase separation when breaking circuit.



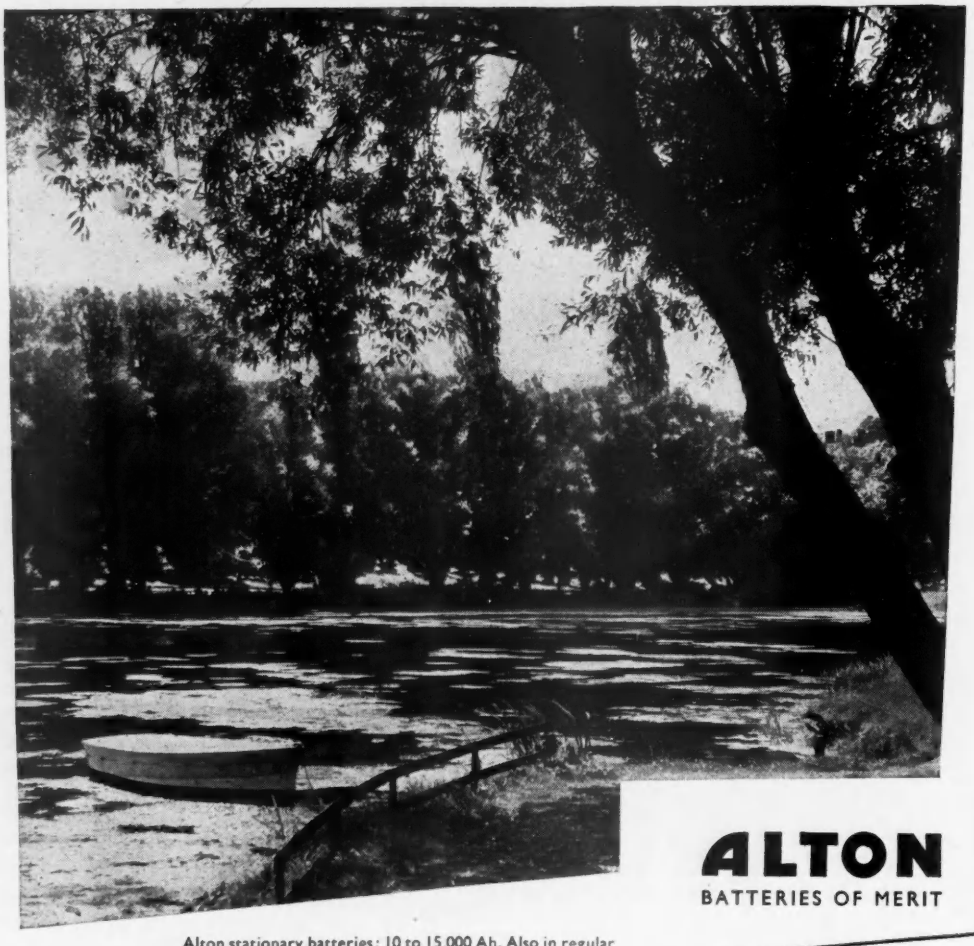
ARROW

Complies with B.S.S. 775 for breaking capacity • 50% saving in weight and size • Coils and contacts changed in a matter of seconds • Exceptionally low wattage consumption • "Straight-through" wiring connections • Conforms with U.S.N.E.M.A. specification • Comprehensive spares facilities in U.S.A. and Canada • Three sizes — 30, 50 and 100 Amps. at 550 Volts A/C rating • D/C ratings on request.

SEND FOR LEAFLET M.C.G. 2

ARROW ELECTRIC SWITCHES LTD · HANGER LANE · LONDON · W.5

This is King's Pond— and its waters almost lap the bricks of the Alton Battery Works' south-west wall. It is part of the Company's property—a 5-acre asset in real estate. And a symbol of assets in wider terms than accountancy covers. Alton is a country town—with a full, rounded, contented life of its own. A town where people have not yet changed to personnel. A town where families take root—and son follows father up to the Battery Works. A place where a man's proper pride in himself and his folk and the life he leads is reflected in doing things just that all-important bit better than 'up-to-specification.' And Alton batteries are made by Alton men



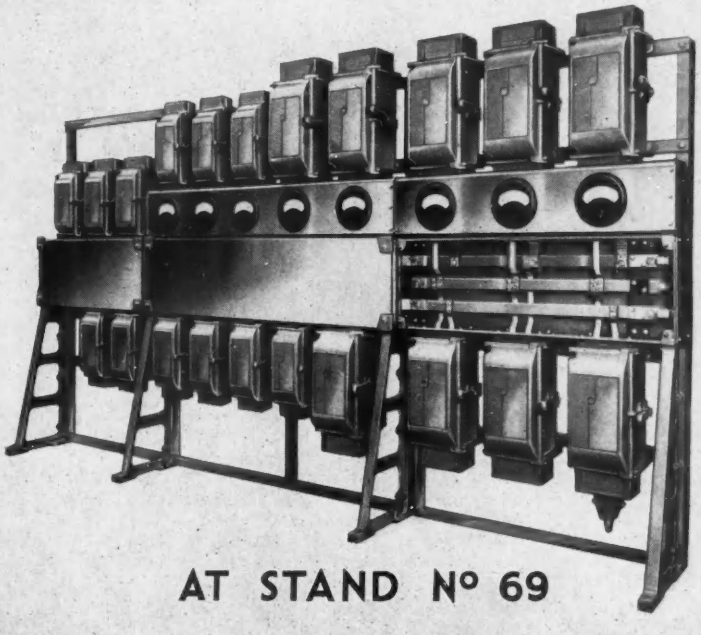
ALTON
BATTERIES OF MERIT

Alton stationary batteries: 10 to 15,000 Ah. Also in regular production, renewal plates for all makes of battery, British and Continental.

A24A

The Alton Battery Company Limited · Alton · Hants · *Telephone:* Alton 2267 and 2268 *Telegrams:* Battery, Alton

You cannot buy better gear



AT STAND Nº 69

A COMPLETE RANGE OF L.T. SWITCH
AND DISTRIBUTION GEAR FROM 15 TO 600 AMPERES.

INDUSTRIAL PANELS.
SWITCHES AND SWITCHFUSES.
DISTRIBUTION BOARDS.
SWITCH SOCKETS AND PLUGS.

A.S.E.E. EXHIBITION
EARLS COURT 16TH-20TH MARCH 1954

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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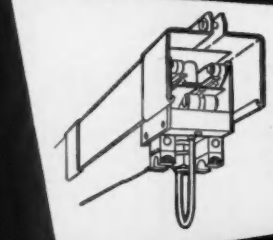
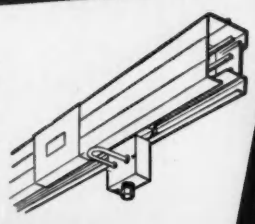
6A PETER ST.	HEAD OFFICE.	HEAD OFFICE.	LECKHAMPTON HILL	WOOD STREET.	CHURCH LANE.	2 LOVELL RD.	232 PRINCE CONSORT RD.	57 VINCENT LANE

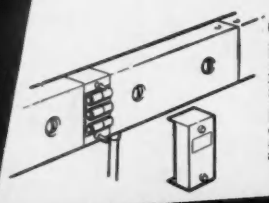


TROLLEY DUCT FEED RAIL
Consisting of one or more trolley collectors running on continuous conductor rails, the E.M.S. Trolley Duct avoids long, trailing leads on portable Tool installations, conveyor systems, movable pendant lights, etc.

"UNIDUCT" FEED RAIL
Designed for 400 volt 3 phase supply, with a maximum loading of 100 amps per phase, the "Uniduct" is particularly suitable for high frequency tool installations on conveyor systems, small mobile cranes and hoists where bare conductors and trailing leads are dangerous.

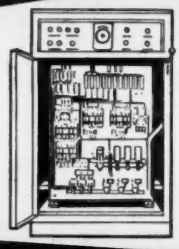


for industrial power users



"MINIBUS" DISTRIBUTION SYSTEM
A miniature Busbar distribution system designed for small industrial installations where total loading does not exceed 100 amps per bar, and the load of each machine does not exceed 30 amps, available for 2 phase, 3 and 4 wire supplied.

CONTROL PANELS
This automatic control panel built for Imperial Chemical Industries illustrates the type of work we can undertake. Panels can be supplied complete or in skeleton forms for building-in.



E.M.S ELECTRICAL PRODUCTS LTD

28, 32 THE BUTTS COVENTRY Tel: Coventry 61091 Grams: Dispatch Coventry

SEE STAND 109 A.S.E.E. EXHIBITION

2000 hammer blows a minute from your electric drill!

Turn an ordinary electric drill into a sturdy hard-working power hammer, simply by slipping a Rawlplug Drill-Hammer into the chuck! This ingenious device converts rotary motion into percussion—one blow per rev. of the drill; with it you can bore concrete, etc. (up to ¾" holes) at really surprising speeds. Weight of blows adjustable to 'light', 'medium' or 'heavy'.

The Rawlplug Drill-Hammer is light and easy to use, yet has ample strength for long service and the severe treatment of practical conditions. An automatic clutch ensures that percussion takes place only when the tool is pressed against the masonry.

This tool will save you a lot of time and money—

Brief specification: *The best operating speed is between 1500-2000 r.p.m. and the Electric Drill should have a minimum ¼" chuck. Capacity: Rawlplug Hammer Drill No. 3H (⅛" diameter) to No. 20H (⅝" diameter). Weight 2¼ lb.*

We are exhibiting at the A.S.E.E. Exhibition at Earls Court, STAND 124—March 16-20

RAWLPLUG WALL PLUGS

DRILL HAMMER

Write now for illustrated folder containing full technical details.

B 474

THE RAWLPLUG COMPANY LIMITED · LONDON · S.W.7

ELECTRIC IGRANIC CO. LTD.

ELECTRICAL ENGINEERS' EXHIBITION EARL'S COURT MARCH 16TH-20TH

A visit to stand No. 131 will enable you to inspect a wide range of standard Igranic starters and auxiliary switches.

If you need control gear varying in design and function from our standard equipment our Engineers in attendance will be glad to discuss your particular requirements.

PRIMARY RESISTANCE STARTER

TRIPLE POLE PRESSURE SWITCH

IGRANIC ELECTRIC CO. LTD. HEAD OFFICE AND WORKS: BEDFORD

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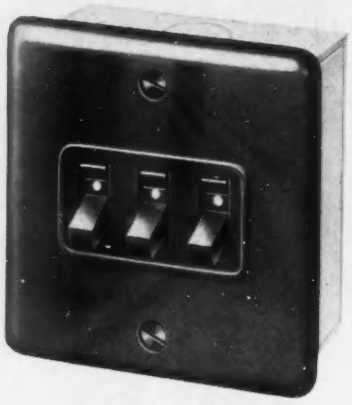
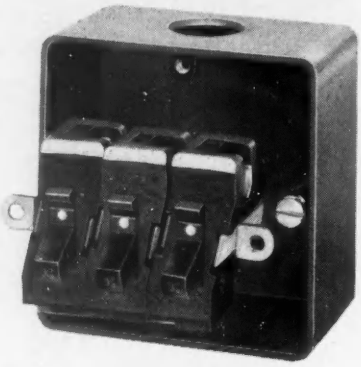
BRANCH OFFICES: LONDON · BIRMINGHAM · BRISTOL · CARDIFF · EAST ANGLIA
GLASGOW · LEEDS · MANCHESTER · NEWCASTLE · SHEFFIELD

3 into 1 WILL go





ONE, TWO or THREE

KERSON

5 amp 'UNI-QUAIL' A.C. SWITCHES

will go into a ONE GANG B.S. 1299 box

A switched-socket to fit the same box is also available

Make sure to see them together with numerous other ***KERSON*** *accessories on*

STAND 97

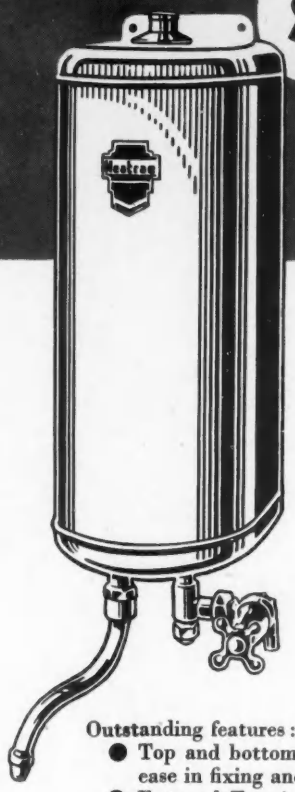
THE KERSONS MANUFACTURING CO. LTD.

HANSONS BRIDGE ROAD, BIRMINGHAM, 24

'Phone : ASHfield 1163-4-5 'Grams : Kersons, Phone, Birmingham

Simplicity—The Hallmark of Genius....

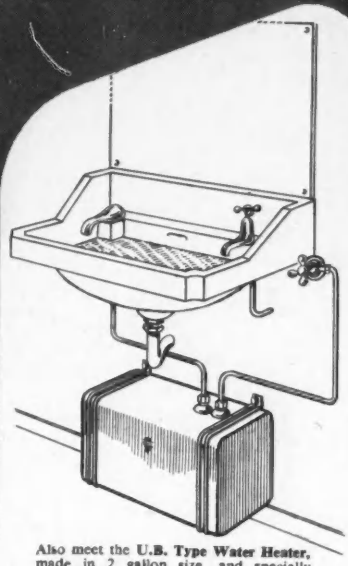
Heatrae electric water heaters are so simple....



Meet the "DOT"!

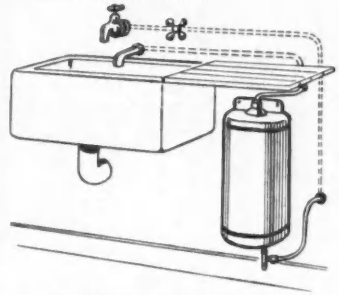
... the dependable, economical and safe Electric Water Heater which, with its flat back and minimum projection, "fits in" any odd corner.

so simple to **install**



Also meet the **U.B. Type Water Heater,** made in 2 gallon size, and specially designed for use where no space is available above the sink or basin. It is automatically controlled. Special fittings are provided for convenience in connecting up these heaters.

so simply **serviceable**



Here is shown how the Heatrae "DOT" can be fitted below the sink or wash basin. The "DOT" can be applied in several different ways to best suit local arrangements.

Outstanding features:—

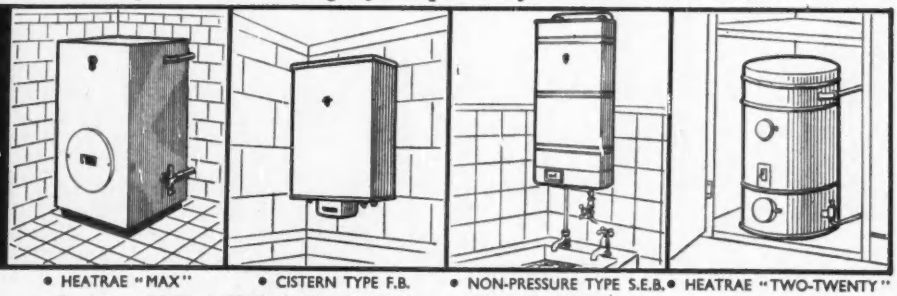
- Top and bottom fixing provides greater ease in fixing and a neater assembly.
- External Terminal Box for easy wiring. The ordinary V.I.R. cables terminate in a cool position.
- Instantly removable core-heating element.
- High-precision thermostat.
- Specially suitable for "Hard water" districts.
- Easily adapted for overhead or underneath service—as shown.

Ask us for Leaflet DE D.

Heatrae

30 years' specialised experience in designing and manufacturing of Electric Water Heaters

Here are some of the extensive range of our products for industrial and domestic uses....



• HEATRAE "MAX" • CISTERN TYPE F.B. • NON-PRESSURE TYPE S.E.B. • HEATRAE "TWO-TWENTY"

Advertisement issued by HEATRAE LTD · NORWICH · ENGLAND

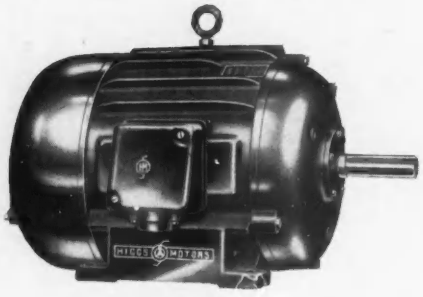
Manufacturers of: Electric Water Heaters, Oil Heaters, Immersion Heaters, Urns, Towel Rails, Airing Cupboard Heaters, Flameproof Heating Apparatus, Breakfast Cookers, Electric Fires, Food Trolleys, Warming Plates, Air Heaters.

TRADE MARK

HIGGS MOTORS LTD

CHAIRMAN WALTER F. HIGGS M.I.E.E.

BIRMINGHAM 6 ENGLAND



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BRITISH STANDARD DIMENSIONS

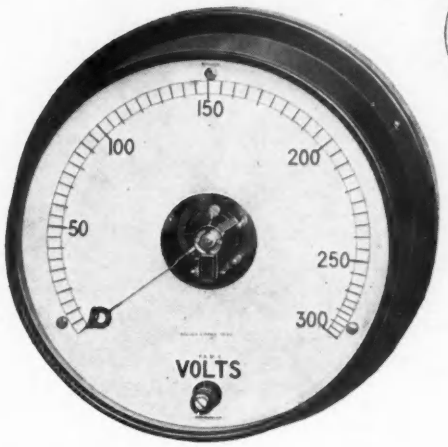
½ to 25 hp

GUARANTEED FOR EVER

Belfast, Bristol, Cardiff, Dundee, Glasgow, Hull, Leeds, Liverpool, London, Manchester, Newcastle, Peterborough, Sheffield, Wolverhampton

NALDERS INSTRUMENTS

PROGRESSIVE
ACCURATE
EFFICIENT



YOUR NEEDS are well catered for by Nalders' wide range of N.C.S. Instruments, high quality being the characteristic of every type. All instruments conform to B.S.S. 89, the cases being of rectangular, square, or round pattern in die cast aluminium or pressed steel, finished bright black stove enamel or other colour to customers' requirements. Two typical instruments are illustrated here, a round pattern Voltmeter and a Power Factor Indicator, Style S.Q.S.

NALDERS PRODUCTS

include

ELECTRICAL MEASURING INSTRUMENTS
Indicating, Recording, Switchboard, Portable

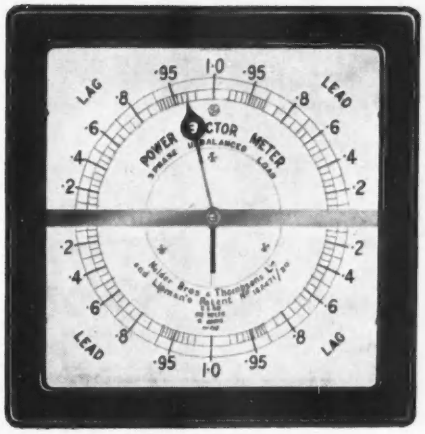
PROTECTIVE RELAYS

VECTORMETERS

AUTOMATIC EARTH PROVING SUPPLY SWITCHES

"BIJOU" CIRCUIT BREAKERS

ETC.



We welcome your enquiries

TELEGRAMS :
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LONDON

NALDER BROS & THOMPSON LTD
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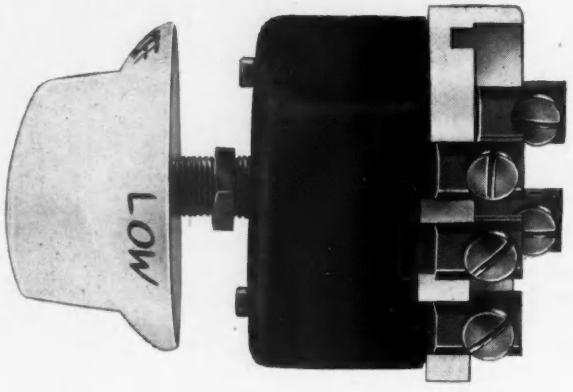
(3 LINES)

TOK takes the lead with this NEW HEAT CONTROL SWITCH

Suitable for Cookers, Hot Plates, Wash Boilers, etc.
Liberal rating at 15 amp 250 v AC
Single or double Pole
Robust Terminals
Standard Fixing
Ceramic Base
Moulded Cover
Ask for Pamphlet No. 18

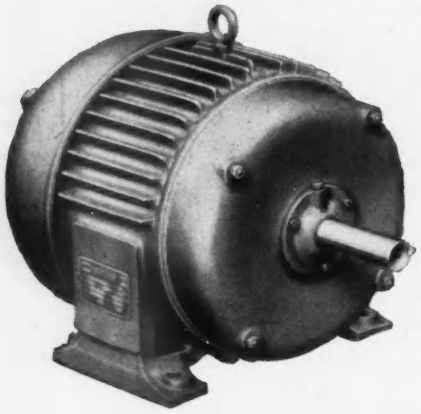


TOK

Address your enquiries to :

TOK ELECTRICAL & INDUSTRIAL MECHANISMS LTD.

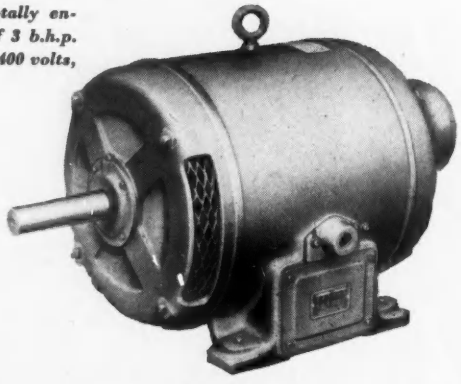
264-270 ST. JOHN STREET, CLERKENWELL, E.C.1 *Telephone : Clerkenwell 2917*



Small Induction Motors

Small Motors, manufactured by our Cardiff works in a range of sizes from 1–80 b.h.p. and conforming to British Standard 168/1936, are designed to suit an almost infinite variety of applications.

Standard Squirrel Cage totally enclosed fan cooled motor of 3 b.h.p. speed 1,400 r.p.m. full load, 400 volts, 3 phase, 50 cycles.



We can also supply Motors manufactured to American NEMA dimensions from 1–7½ b.h.p., 3 phase, and from 1 to 5 h.p., single phase. All motors carry the guarantee of high quality which is associated with all Brush products.

Stock lists are available with our publication No.11002

Visit Stand 100—A.S.E.E. Exhibition, Earl's Court, March 16th-20th.

Standard Slip Ring screen protected motor of 25 b.h.p., speed 1,430 r.p.m. full load, 400 volts, 3 phase, 50 cycles.

Write today to
OR TELEPHONE RHIWBINA 1691

BRUSH

THE BRUSH ELECTRICAL ENGINEERING CO. LTD., HOPKINSON WORKS, CARDIFF, GREAT BRITAIN.

BIRMINGHAM · BRISTOL · GLASGOW · IPSWICH · LEEDS · LONDON · LOUGHBOROUGH · MANCHESTER · NEWCASTLE · SHEFFIELD

B6

Full Employment!

BRITAIN'S demand for electricity is greater than it has ever been; more factories and farms, more homes and offices are all using more — and they will require still more electricity in order to raise output and increase our standard of living.

To meet these needs, 40 new power stations have been brought into operation since British Electricity was established and the amount of power available has been increased by 50 per cent. But generating plant, which *could* work to capacity all day and night is *in fact* only required to give full output for short periods once or twice during the day.

If electricity were more widely used, by factories, farms, shops, homes, offices and for street lighting — this would keep the generating plant more fully loaded. The demands on the power stations coming from these different classes of consumers, would be diversified. That is to say the loads would not occur simultaneously but, in the main, at different times of the day — and continuous full output from the generating plant would reduce the cost of electricity.

THIRD ELECTRICAL ENGINEERS EXHIBITION

EARLS COURT—16th to 20th March, 1954

10.00 a.m.—7.00 p.m.

The British Electricity Authority's stand at this exhibition will feature the growth of demand for electricity over the past 3 decades. Other information and publications concerning the activities of the Industry will be available at an Information Kiosk.

For the interest and information of both technical and non-technical visitors, arrangements have been made for organised parties to visit the two nearest British Electricity power stations, Battersea and Fulham, on each day of the exhibition. These visits will take place at 2.30 p.m., the participants, up to a maximum of 20 persons in each group, assembling individually at the power station gates at that time.

Tickets for the visits will be available from the Information Kiosk on the Authority's stand, the telephone number of which will be FULham 3236.

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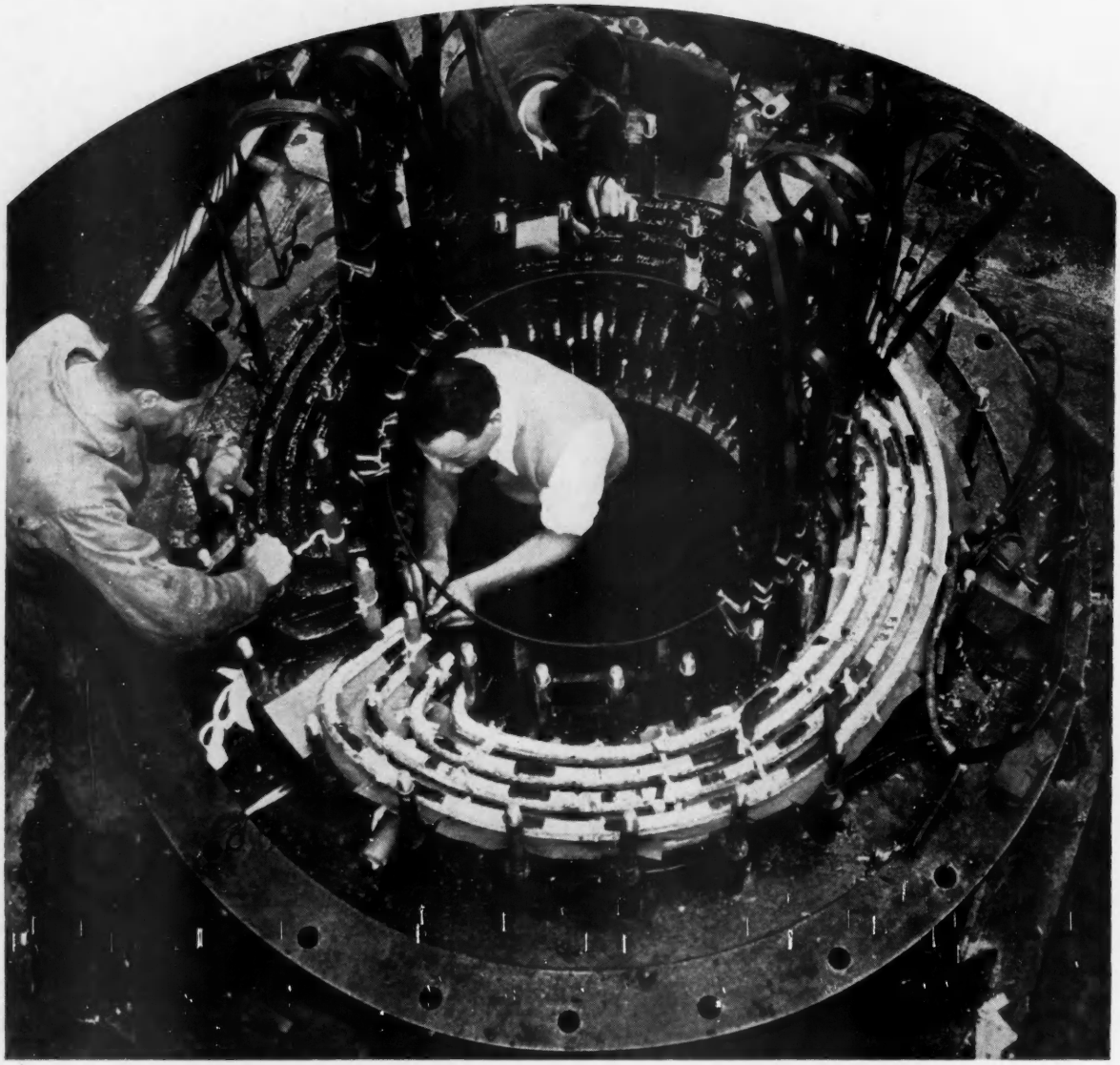

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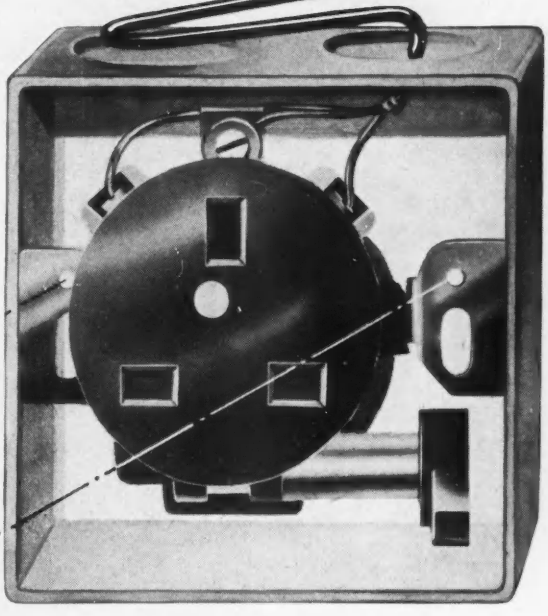

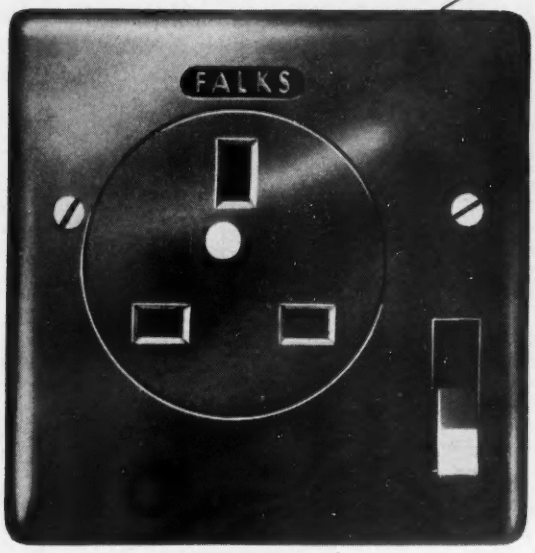

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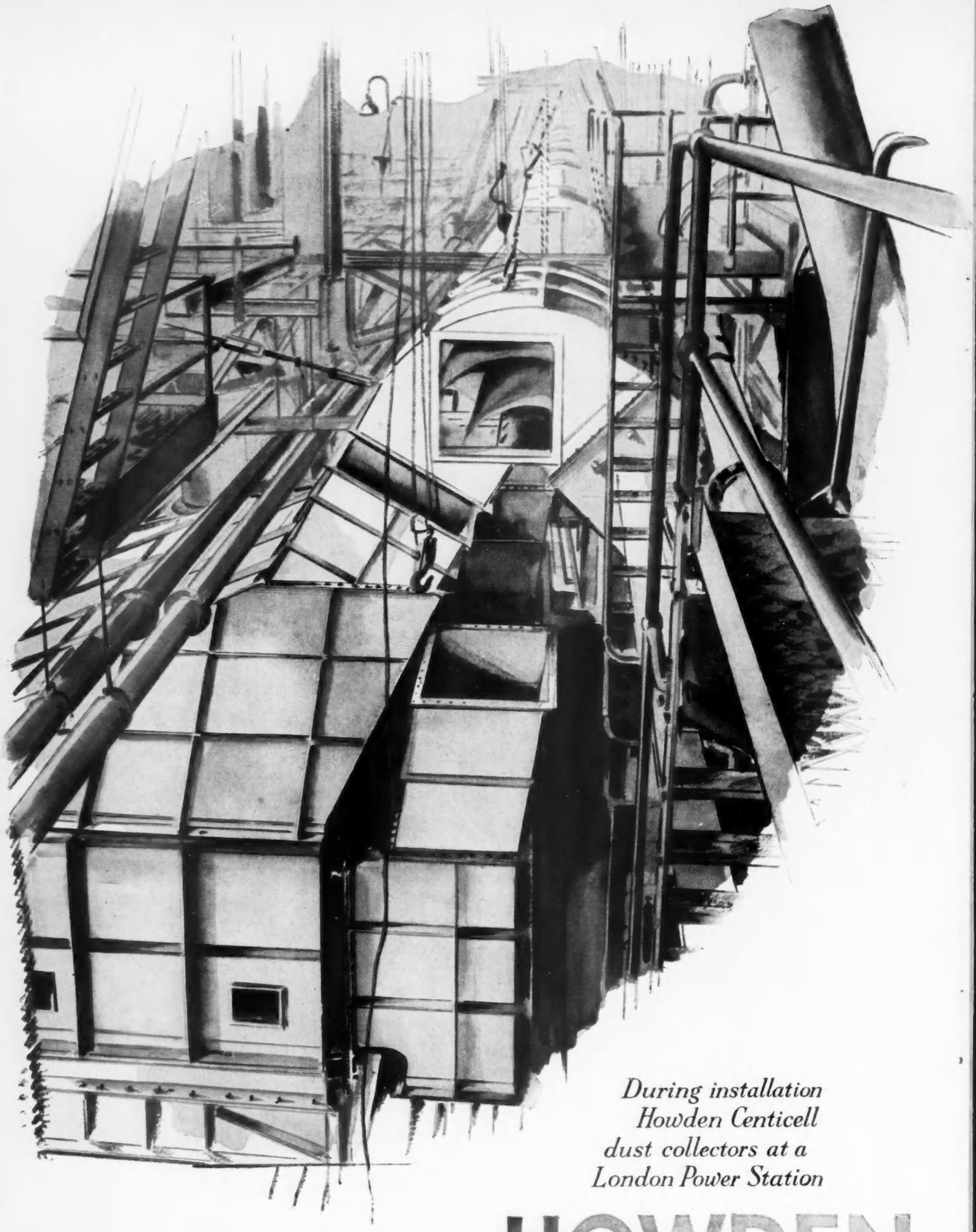

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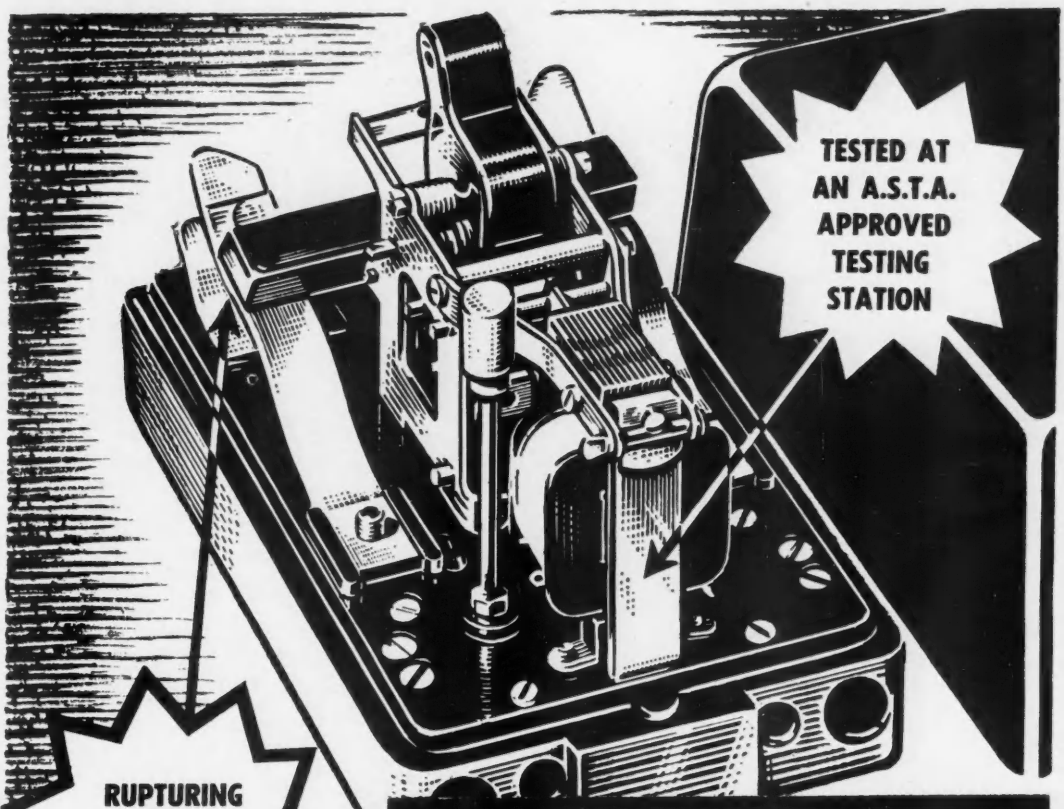

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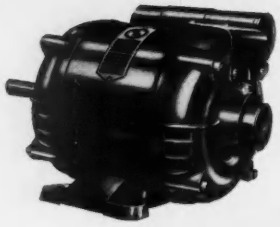

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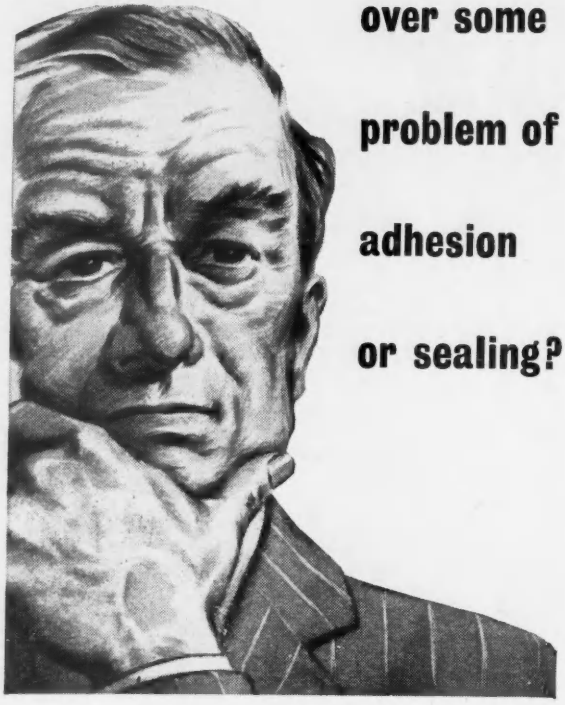

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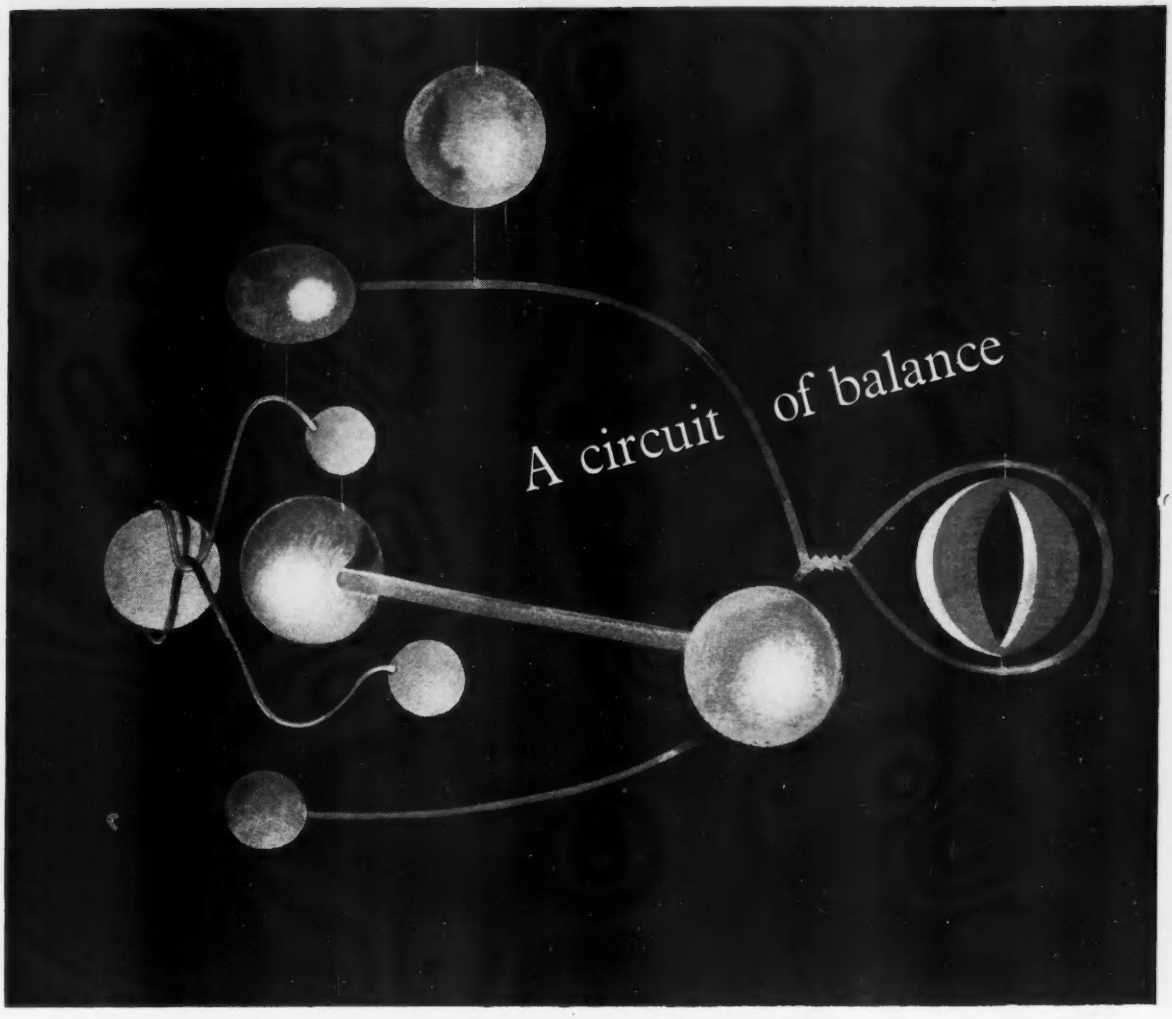

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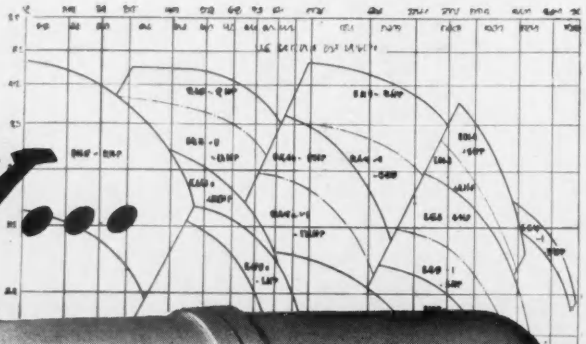

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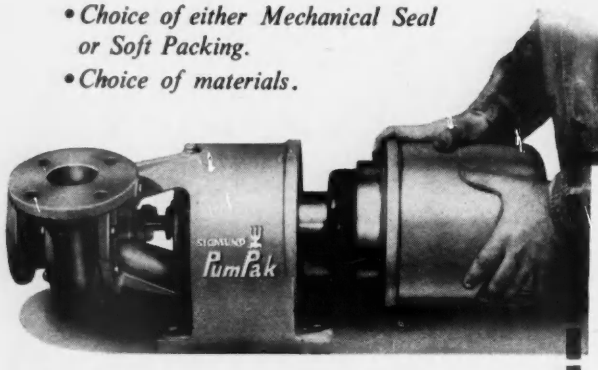

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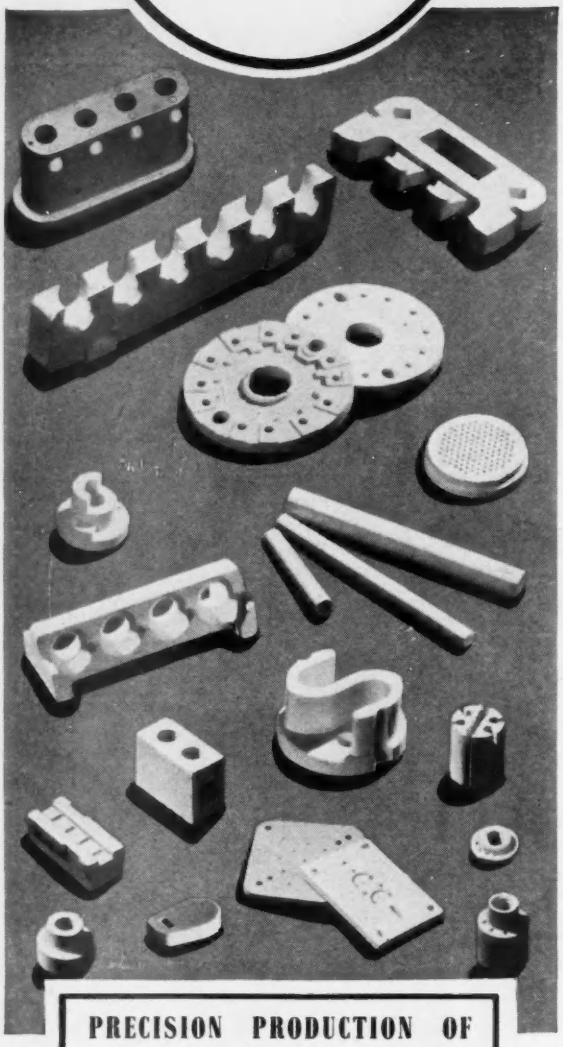

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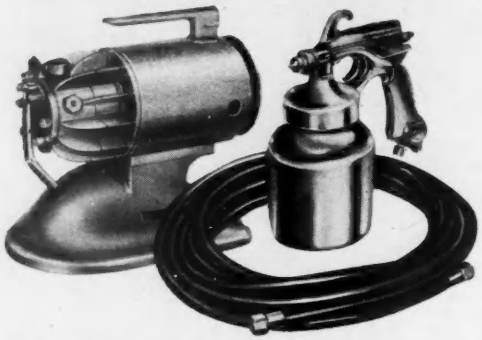

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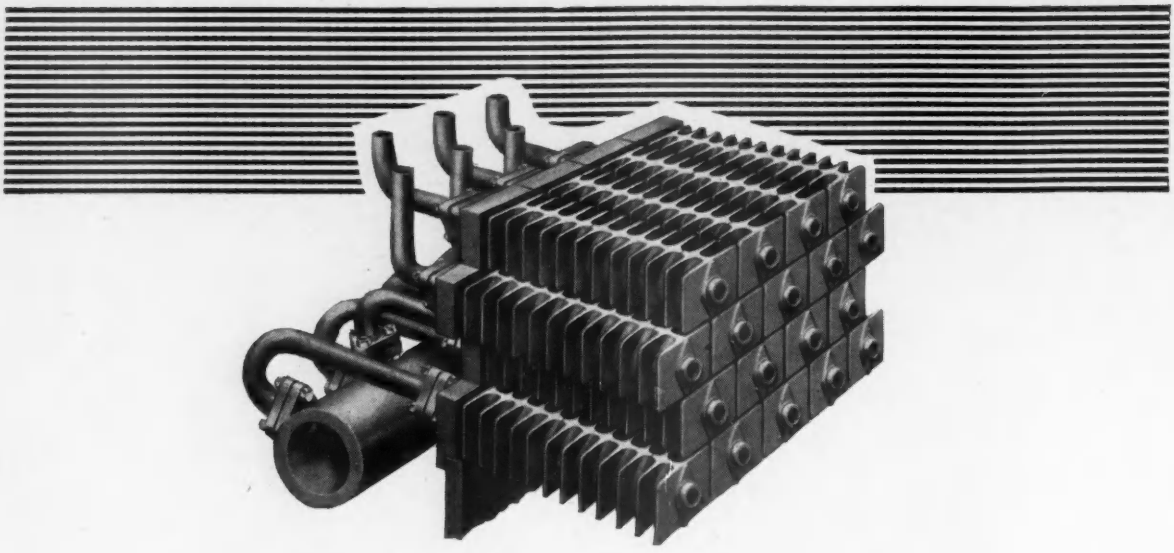

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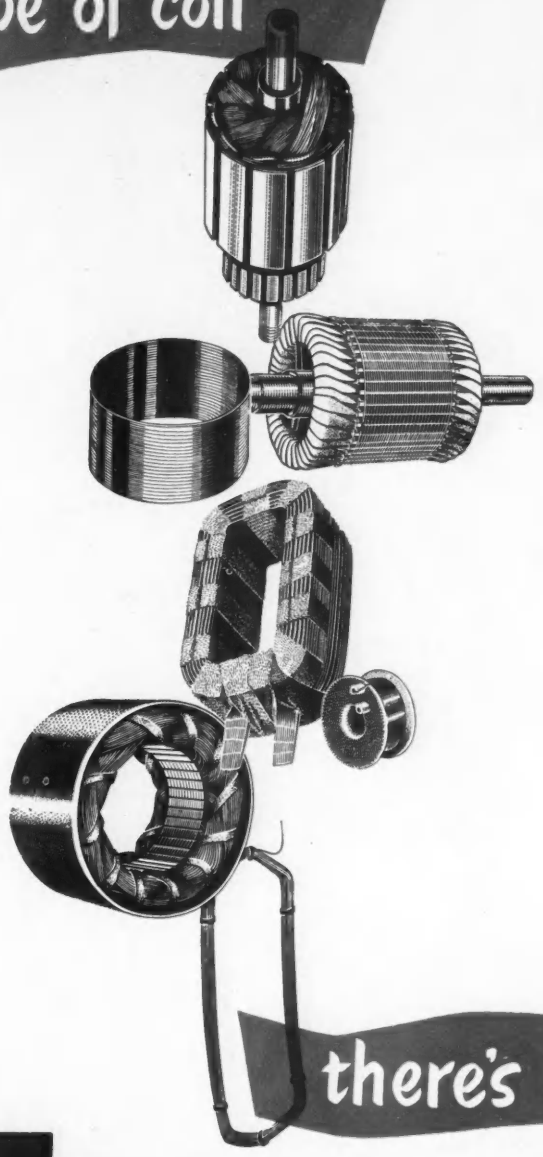

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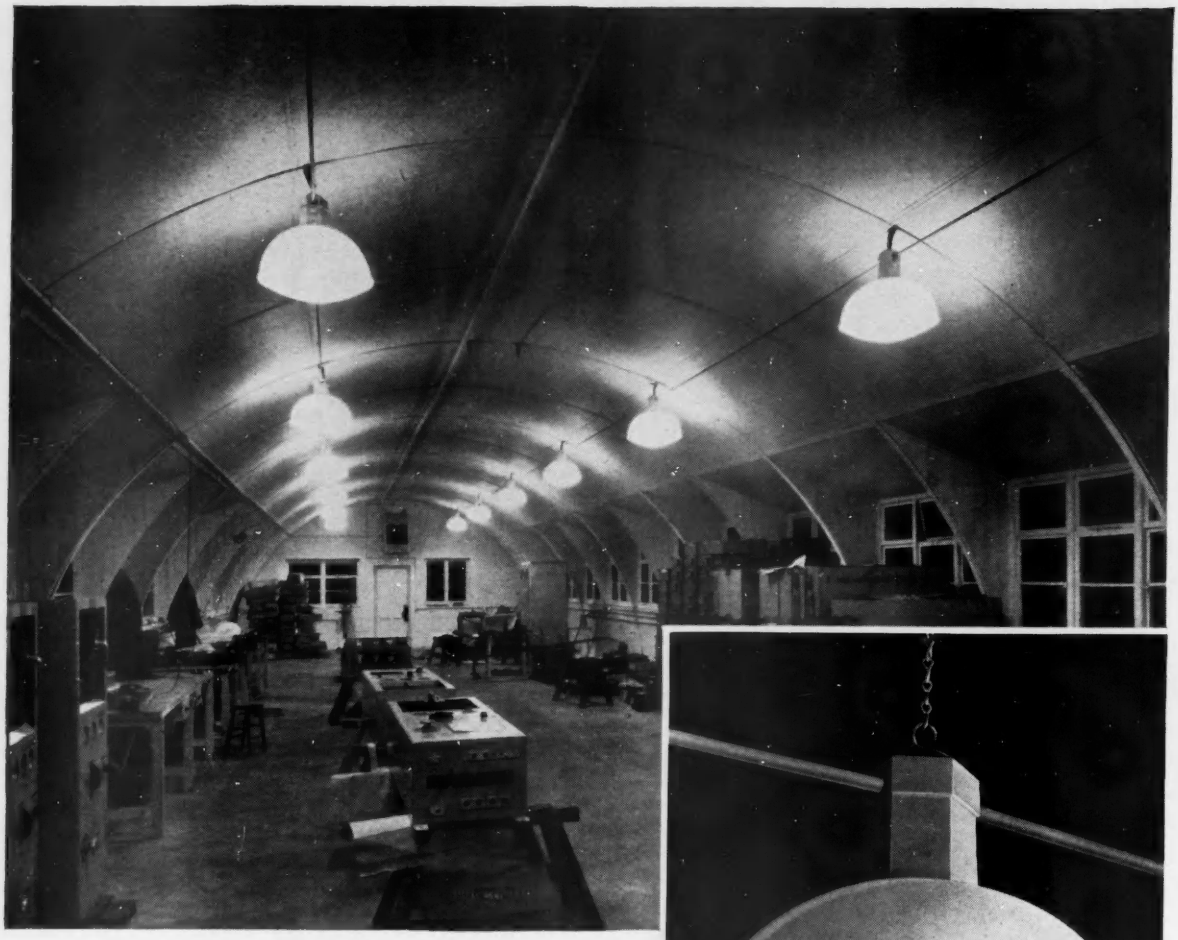

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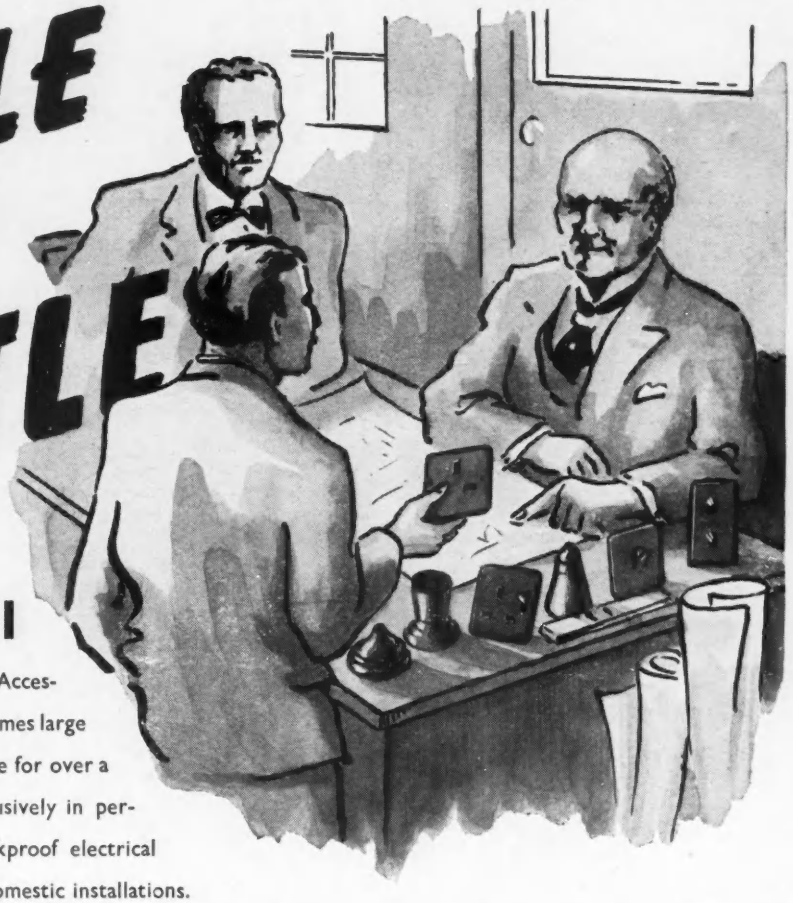

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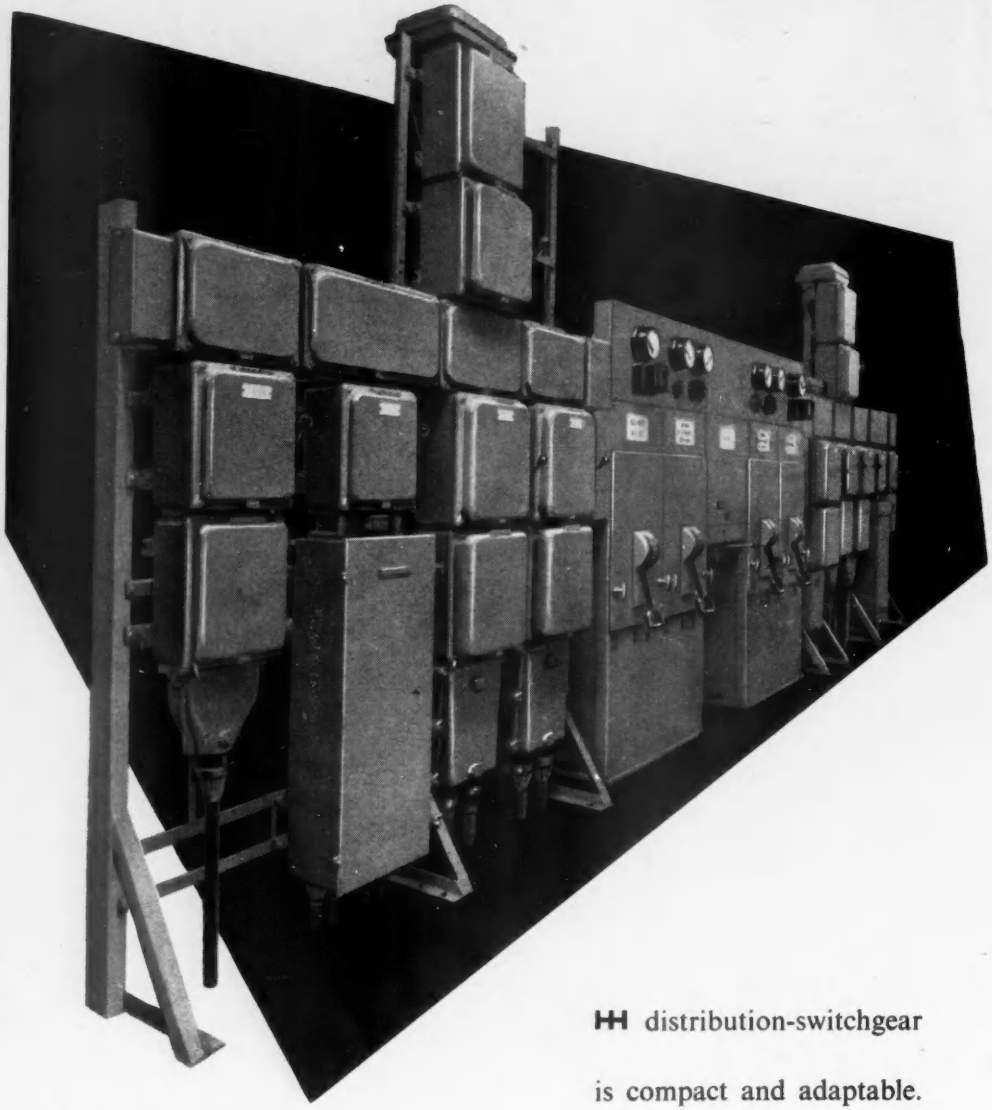

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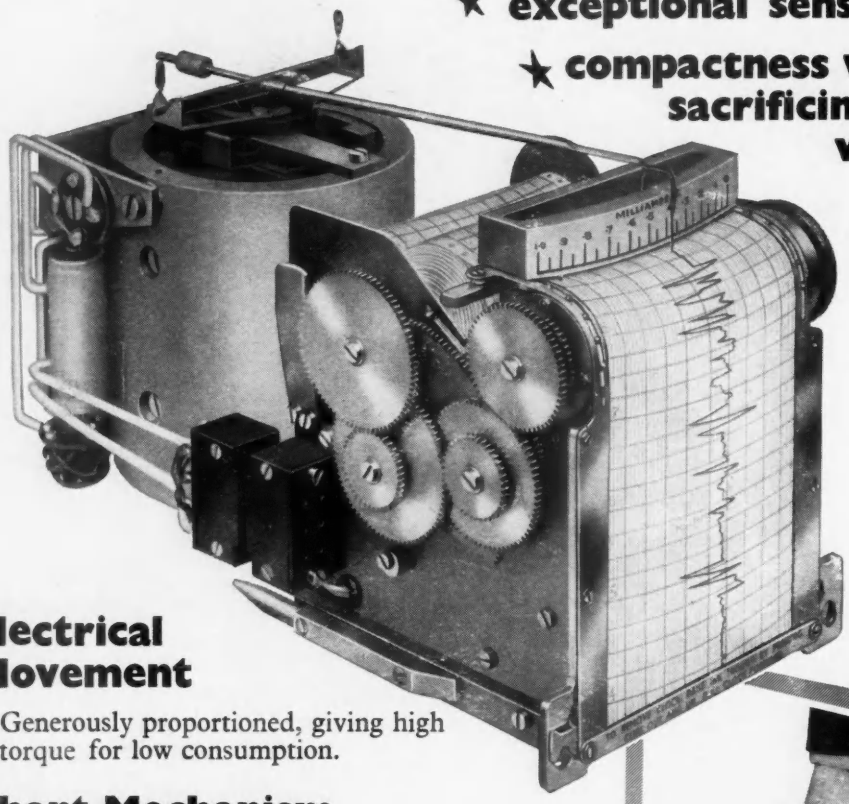

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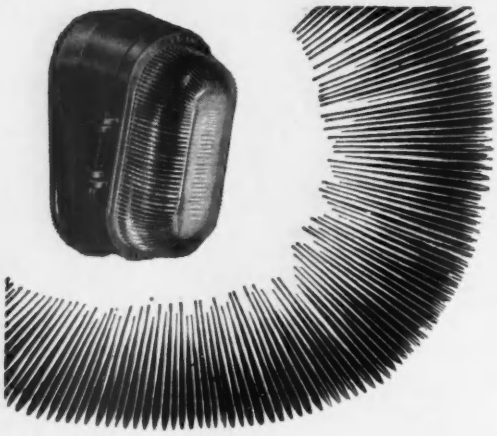

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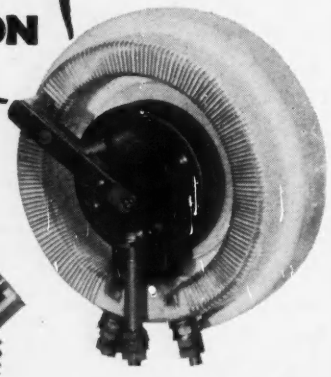

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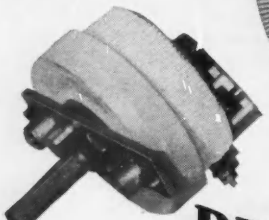

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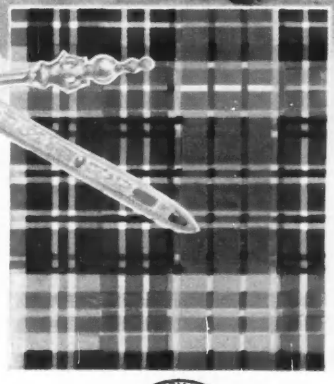
The saving of the ancient regalia of Scotland is one of many incidents in the romantic history of the Ogilvies which goes back to 1172, to the time of Gilbert, a son of the Earl of Angus, who assumed the name of his property, a barony in the parish of Glamis, Forfarshire. Cromwell's troops were besieging Dunottar Castle, and the Governor, George Ogilvie of Barras, knowing that the Regalia was in the castle and fearful of being starved into surrender, determined that it should not fall into the hands of the besiegers. By arrangement, the wife of the Minister of Kinneff visited Ogilvie's wife by permission of General Morgan the blockading officer. On leaving, she secreted the crown amongst some clothes she carried. Morgan gallantly helped her to mount and, followed by her maid carrying the sword and sceptre in a bundle of flax on her back, passed safely through the English lines. The regalia lay in various hiding places until Charles II's restoration.



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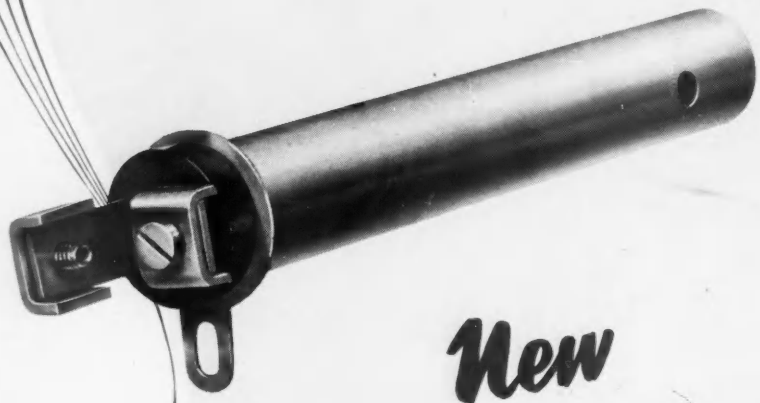
PROGRESS IN CONTROL



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WATER HEATER THERMOSTAT

at half the price!

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TAS/Sc.D.282

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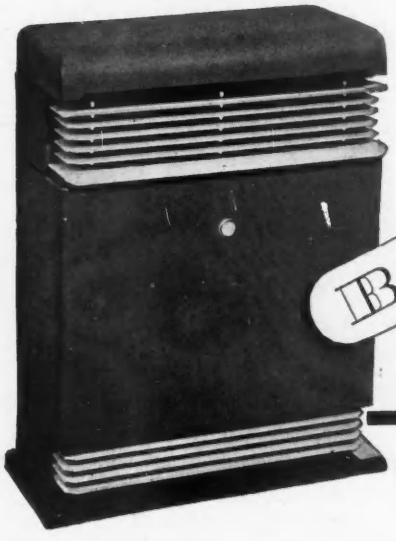

The stimulating comfort of the convector-warmed waiting room . . . the efficiency of the office warmed *before* staff arrive by a time-switch controlled Convector . . . the smart appearance of the latest B.N.E. Model P.20—these are the selling points that can bring you profits. Your latent customers may not realise the advantages of the electric convection heater with its automatic thermostat and facility for time-switch control. Tell them! Show them how *they* will benefit. There is a lot of business among shopkeepers and professional and business men if you back your story with the smart B.N.E. Convectors. P.S. If you are interested in a mailing scheme, we would like to co-operate with you. Write to us for details.

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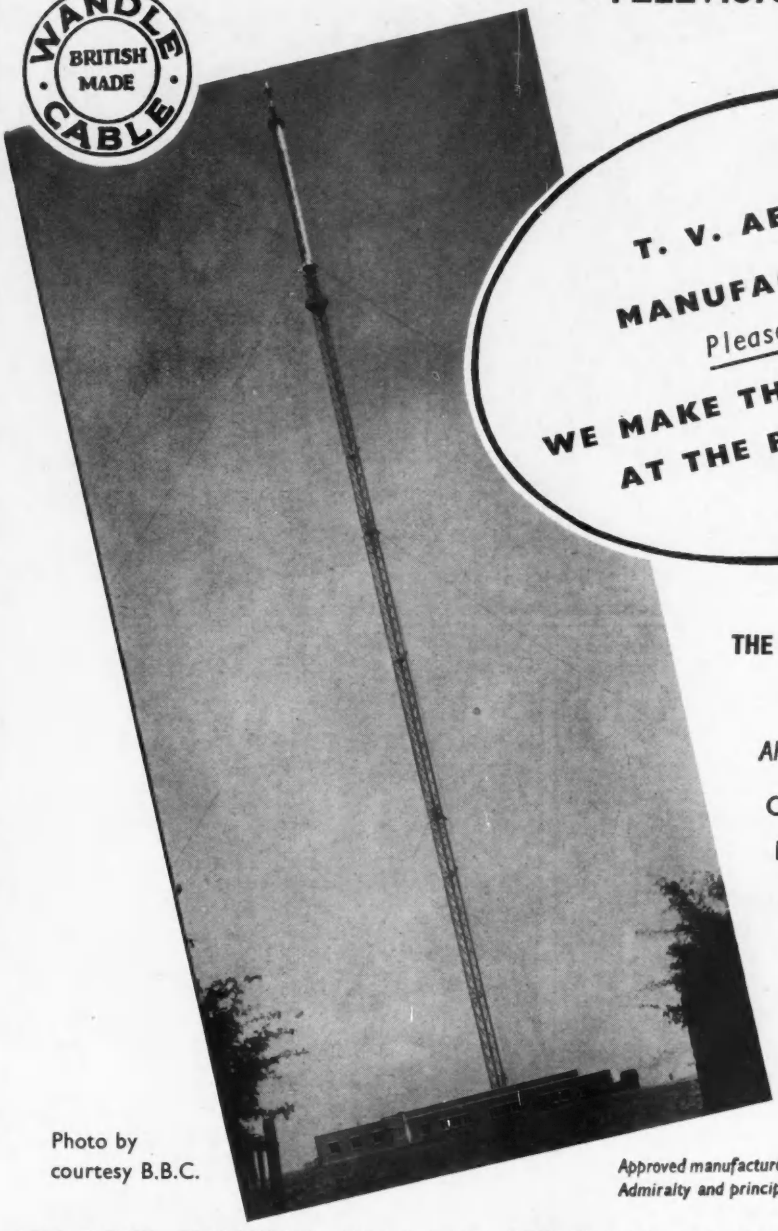

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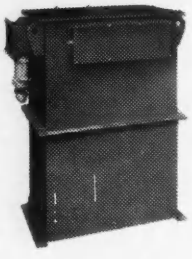

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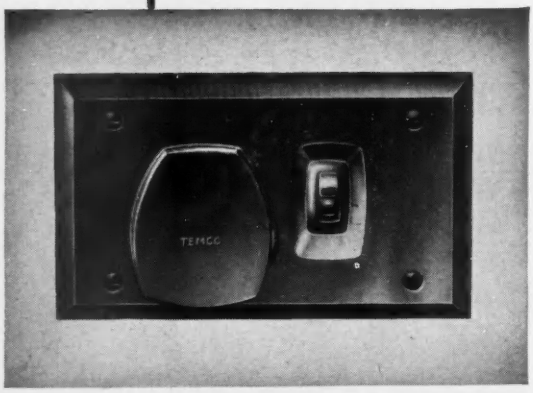

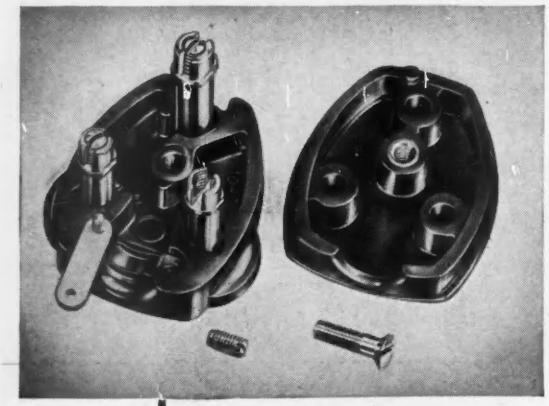

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STAND No. 71
ELECTRICAL ENGINEERS EXHIBITION
Earl's Court, March 16-20

HOUSE OF COMMONS

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STAND 59
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EARLS COURT
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★ *Superior Quality*
★ *Utmost Reliability*
★ *Superlative Design*

TO BRITISH STANDARD SPECIFICATIONS 52, 67 & 816

The above illustration depicts a small section of our recently introduced range of wiring accessories.
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The needs of the Electrical Wiring Contractor are completely fulfilled by the generous dimensions and easy access to all wiring terminals.

Samples sent on request.

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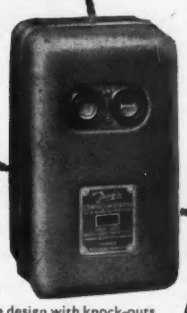
Showing the conduit connection

THE DANFOSS MOTOR CONTROL GEARS



We still stock the design with knock-outs.

secure attractive looking installations, but the remarkable point being the reliable construction and the great adjustment range of each single thermal relay.

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Made to appropriate British Standard Specification conduits BSS No. 31.

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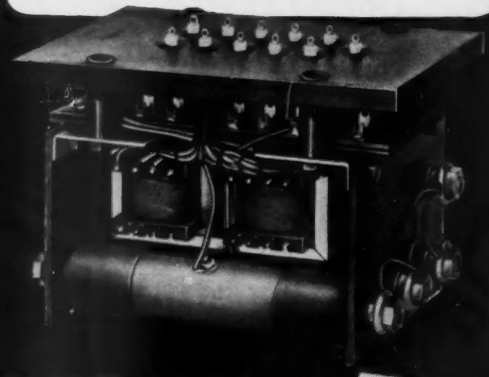

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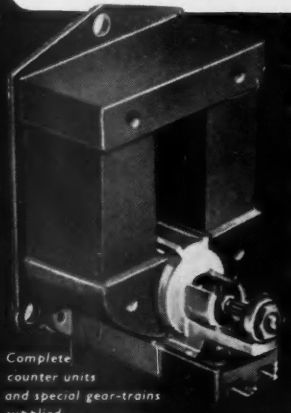

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ELECTRICAL AND ENGINEERING EXHIBITION
STAND No. 67
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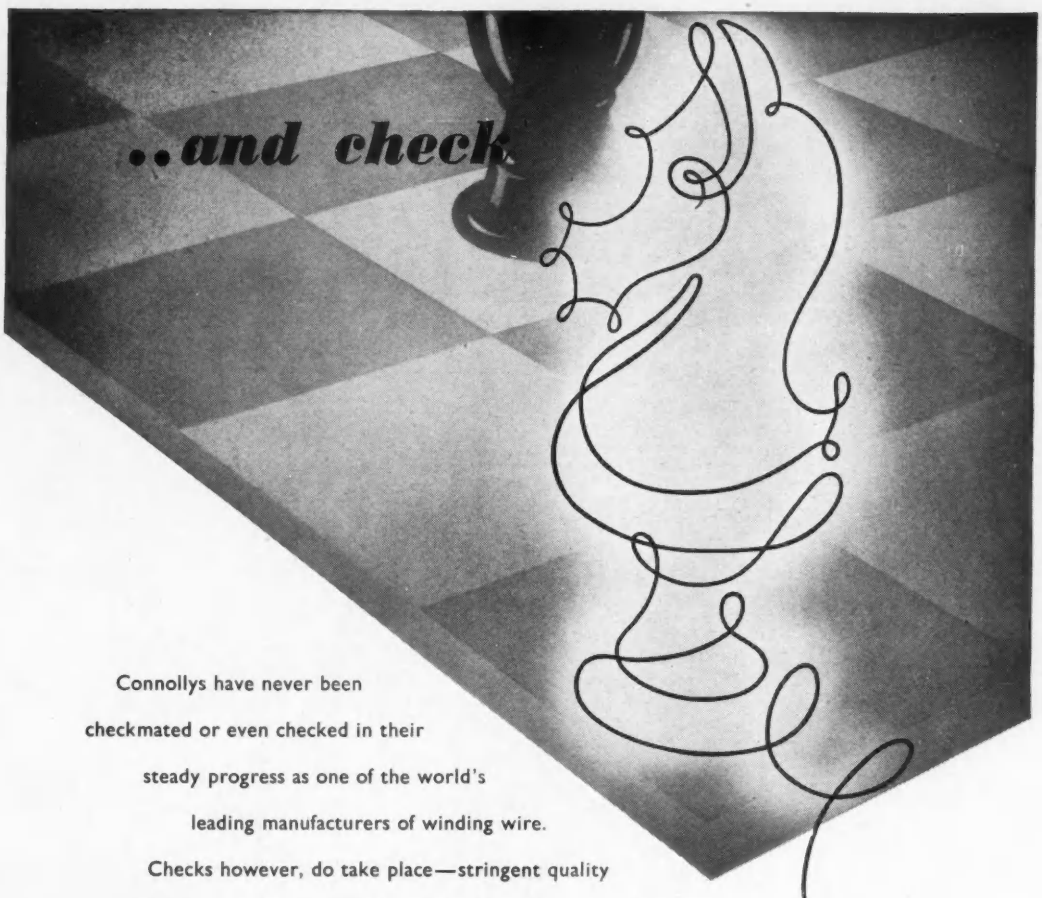

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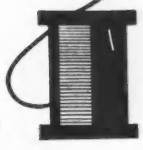

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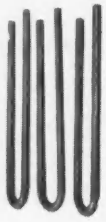

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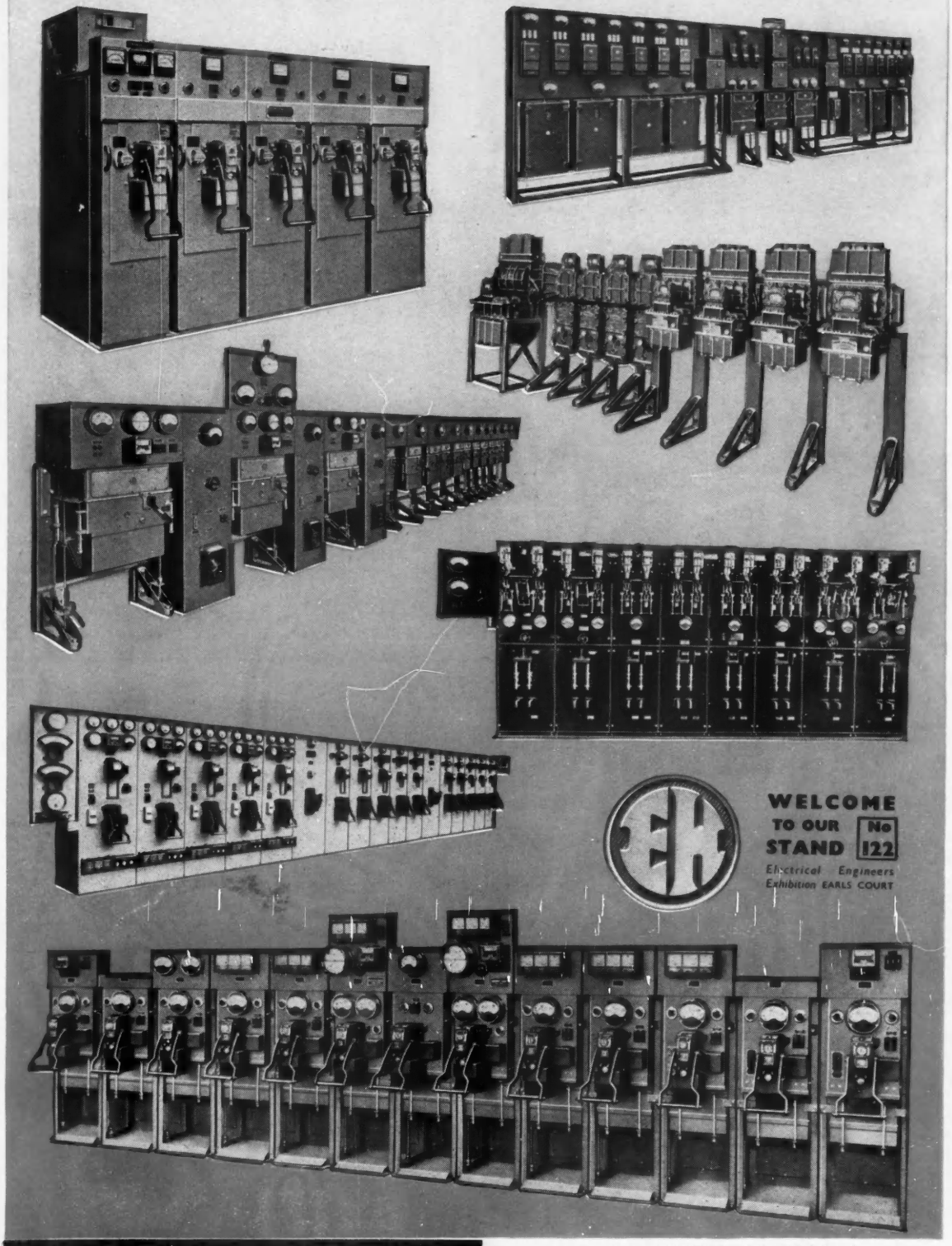

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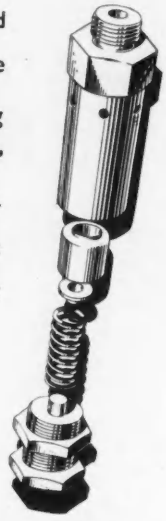

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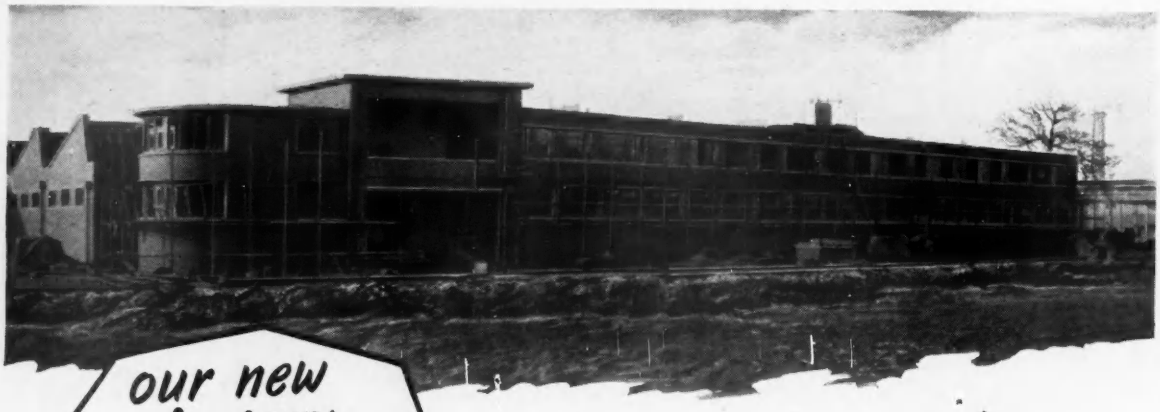

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ELECTRICAL ENGINEERS' EXHIBITION
EARL'S COURT, MARCH 16th - 20th

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FOR ELECTRIC
WATER HEATERS
IS AN INSTRUMENT
OF QUALITY

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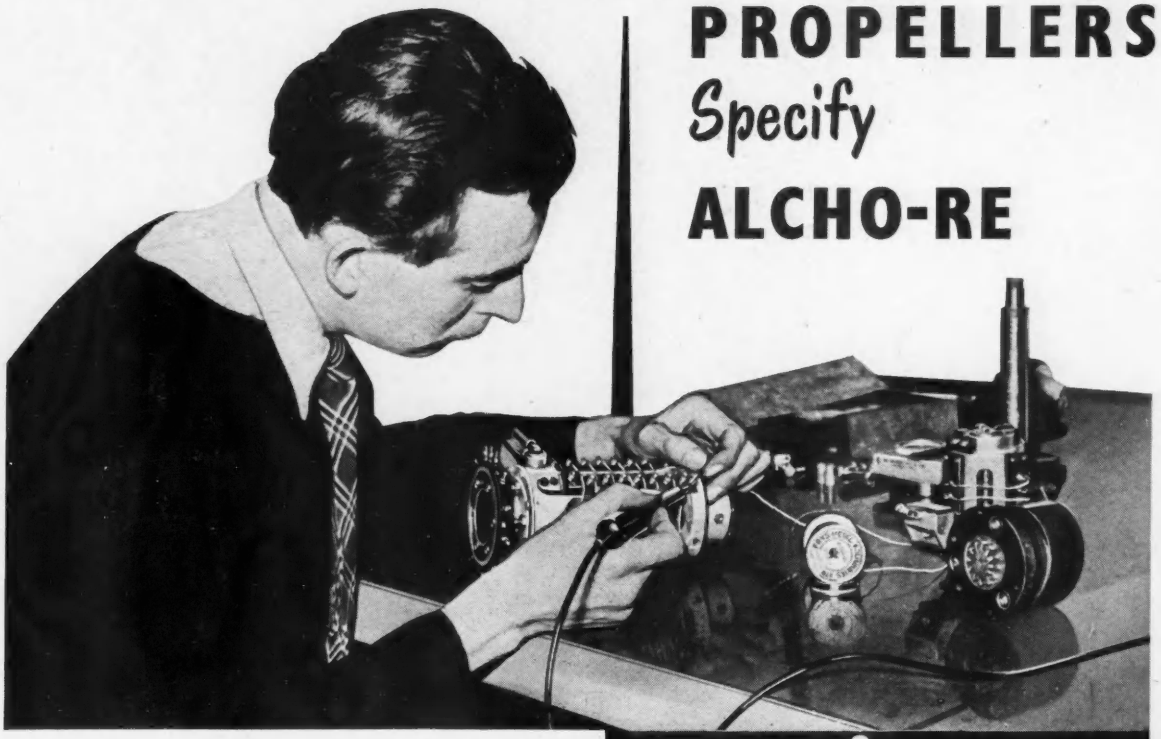
For perfect results... DE HAVILLAND PROPELLERS Specify ALCHO-RE



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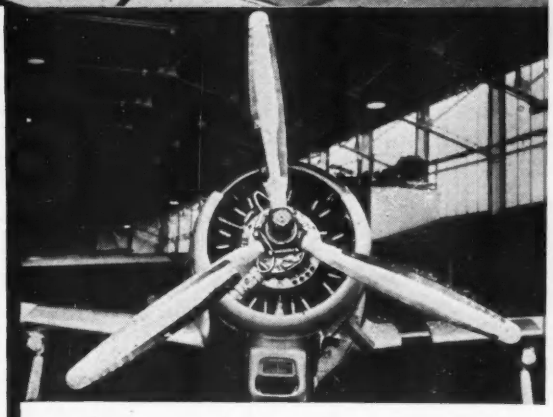
No matter what your problem may be concerning soldering, FRY'S Research Department is available to assist you. Please send your enquiry by letter — or ring us. You'll find that we will be pleased to be of assistance.



In the first picture a connection is being made between slip rings and an electrical register unit devised by de Havilland Propellers Ltd. The small picture shows details of the propeller blades as they are wired-up to record stresses in the metal of the blades in flight.

Soldering simply means FRY'S

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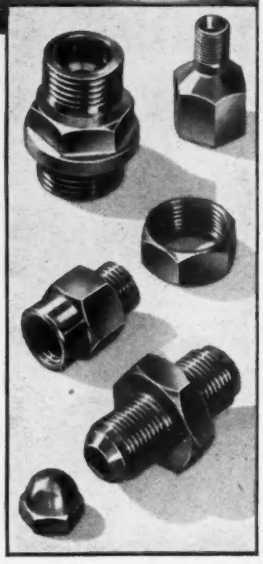

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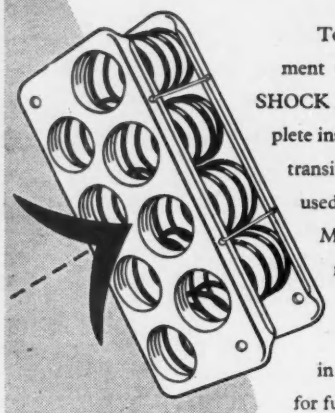

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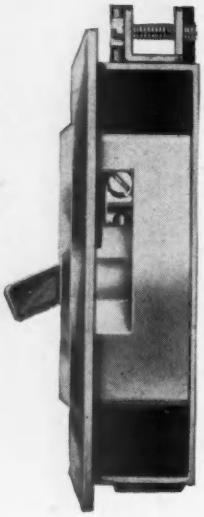

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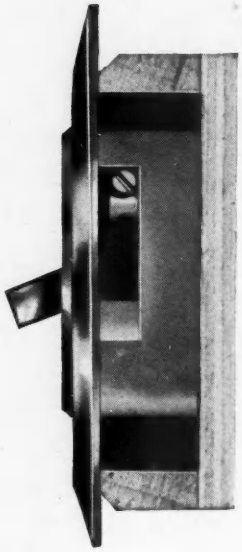

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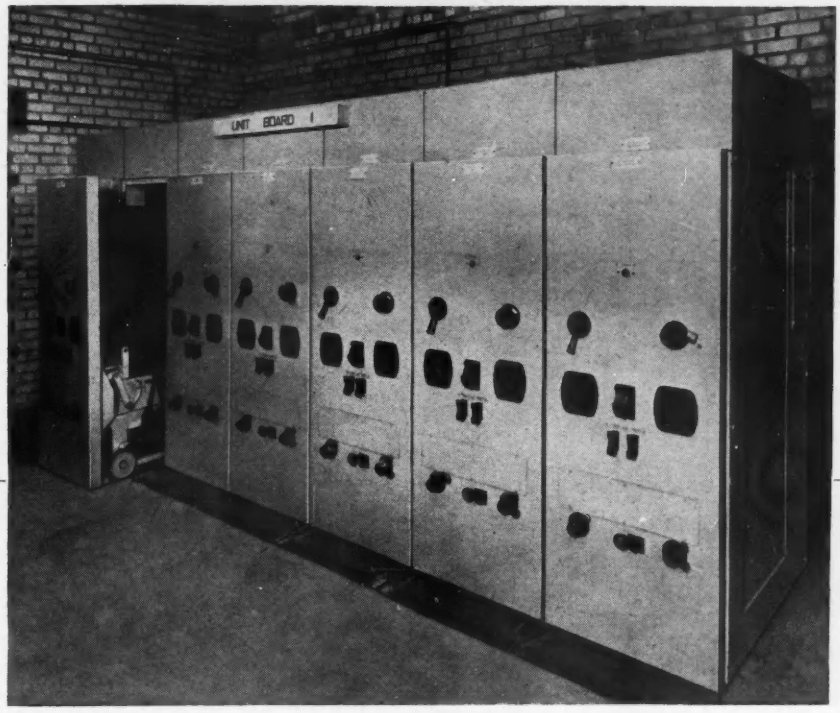
Switchgear for Bold Power Station



The 'ENGLISH ELECTRIC' Company are installing the main auxiliary switchgear comprising 29 type OB.33L 3,300 volt, 36 type OB.2 and 5 type OB.3 415 volt airbrake circuit breakers at the Bold Power Station of the British Electricity Authority.

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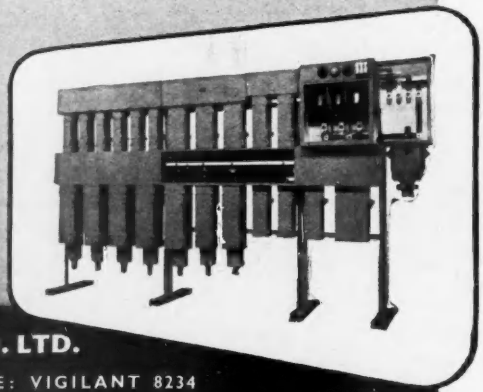

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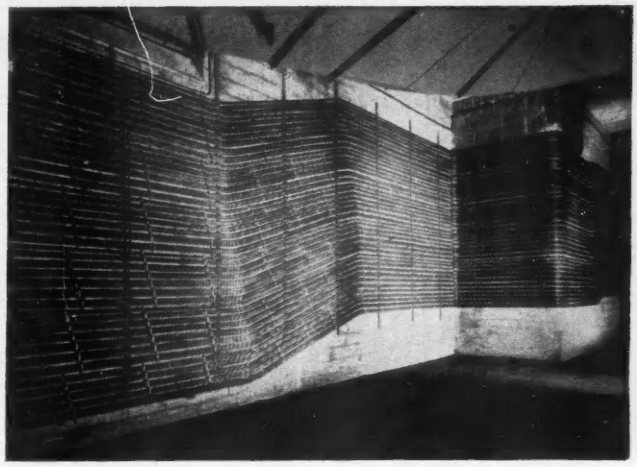

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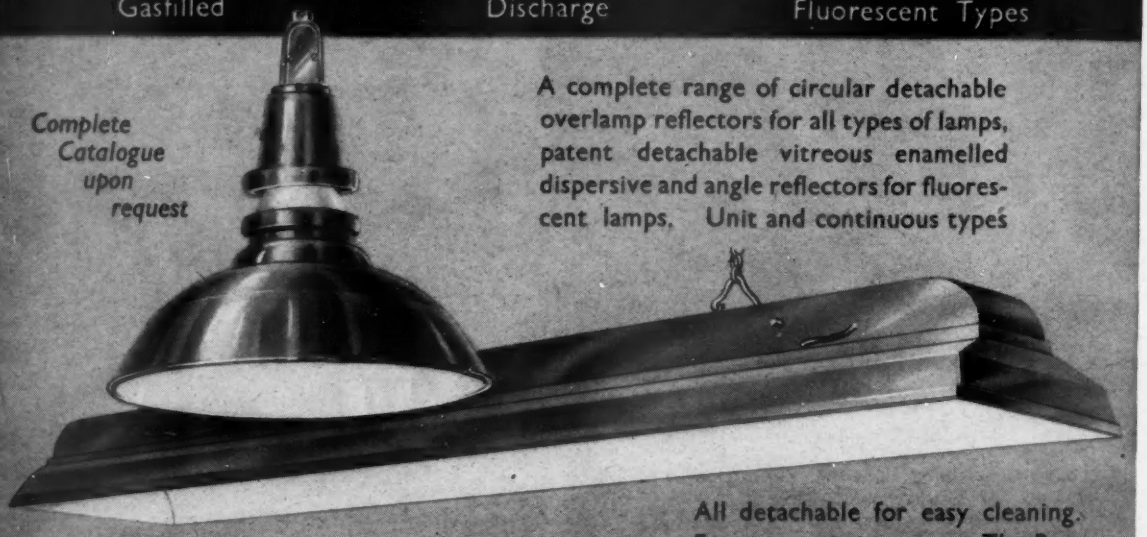

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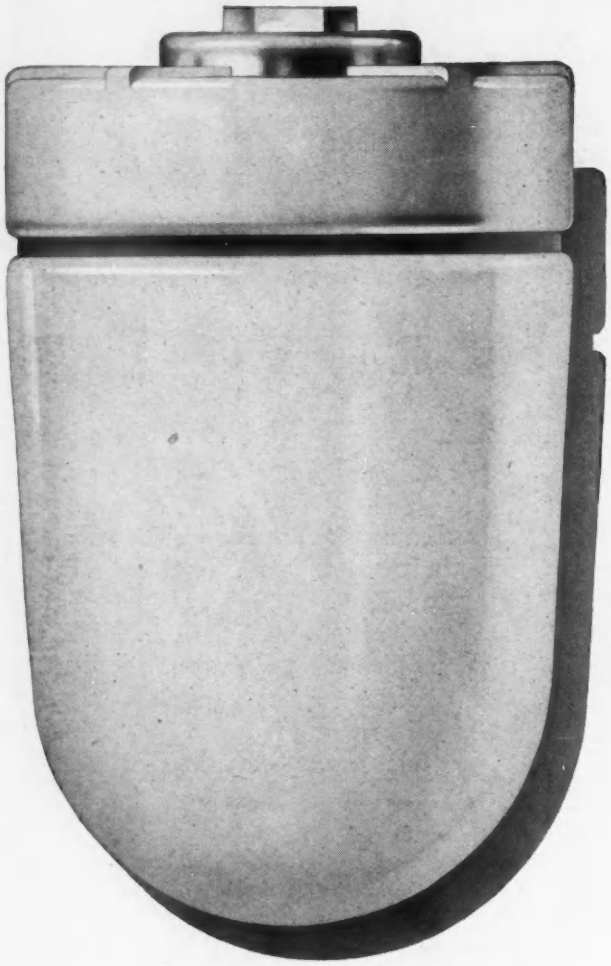

The above illustration of the Standard 200 watt size fitting (List. No. 1021) shows the top ribbing formation incorporated on this model.

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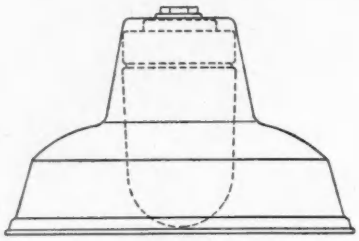

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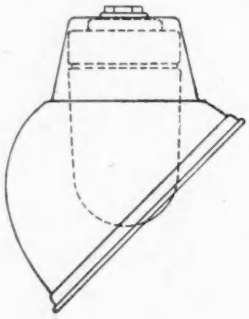

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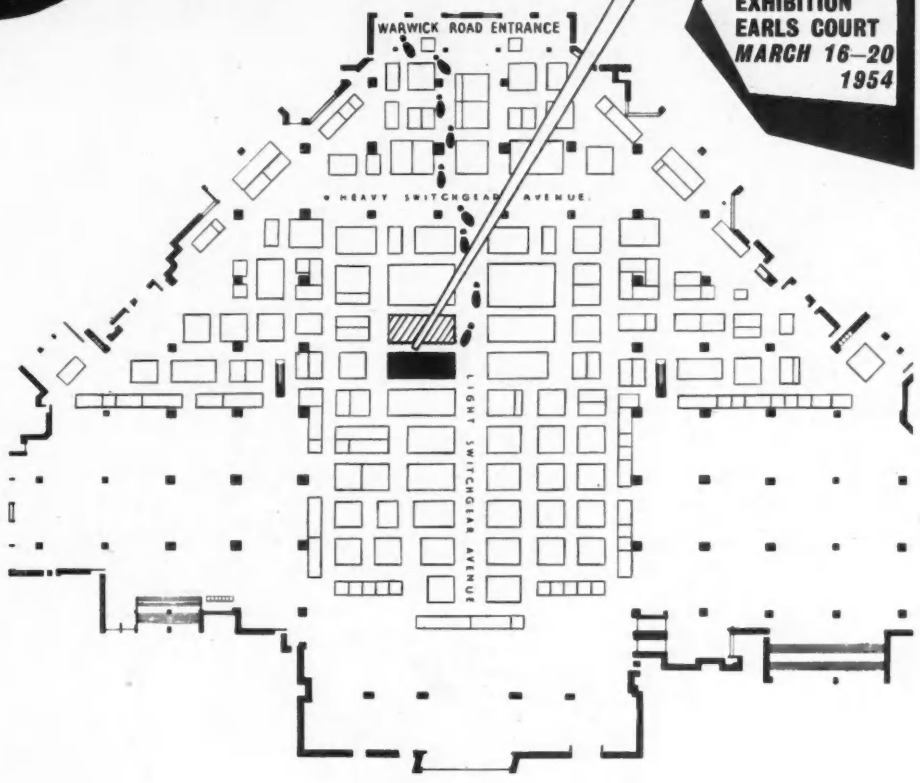

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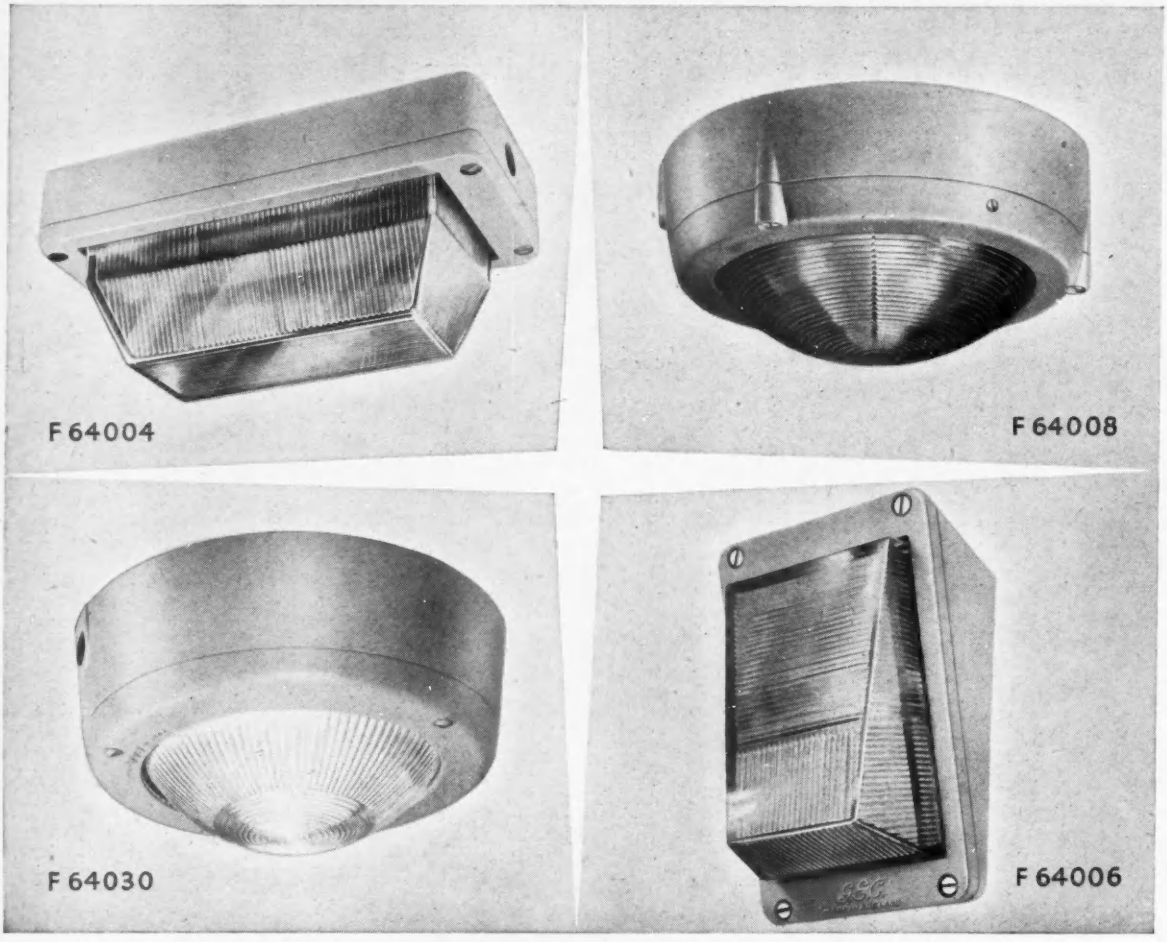

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THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 11 MARCH, 1954
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Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Assistant Editors:
J. K. JOHNSON, B.SC.(ENG.), A.M.I.E.E.
K. C. POUNDS, B.SC.(ENG.), A.C.G.I., A.M.I.E.E.

In This Issue

Voltage-Current Relationships in Rectifier Load Circuits, by *R. Wells*, A.M.I.E.E. 343
Orlando Station Extensions 349
The Hydrogen-Oxygen Reaction 350
New Factory for High Vacuum 351
Readers' Views 352
Adamjee Jute Mills, Part II, by *H. R. Nimmo*, M.SC., B.E., A.M.I.E.E. 353
300 kVA Air-Cooled Transformers 356
Electrical Engineers' Exhibition 357
Notes on Wiring, by *Megohm* 369
Measurement of Iron Losses 370
Controlling a Large Machine Tool 371
Overseas News 372
Personalities in the Industry 374
British Standards 376
Problems and Practice in Engineering ... 377
Equipment for Industry 378
For the Electrical Trade 379
News of the Week 380
Electric Supply News 384
Company Activities 385
Questions in Parliament 386
Commercial Information 387
Classified Advertisements 75
Index to Advertisers 82

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ELECTRICAL EXHIBITION

From humble beginnings the A.S.E.E. Electrical Engineers' Exhibition has in three years grown to a size exceeding that of the electrical section of the B.I.F. The need for the industry to hold its own exhibition has been a perennial subject of conversation in electrical circles since the first exhibition over fifty years ago. No one, however, appeared willing to take the first step particularly at a time when it was commonly felt that there were too many exhibitions; now the industry is in effect presented with an accomplished fact. The exhibition that will open at Earls Court next week will provide a common meeting ground for engineers within the ambit of electrical interest, and it is this unique character that has contributed so much to its success. The rapid growth in popularity contrasts markedly with the gradual decline in appeal of the B.I.F. and it is difficult to see the eventual outcome. Clearly the industry likes its own exhibition but none the less cannot but recognise the strong Government sponsorship of Castle Bromwich with the traditional special appeal to overseas buyers. With the high cost of exhibitions today, the existence of two exhibitions within six weeks of each other is an uneconomic expenditure which the industry should not be called upon to face. Yet both serve a useful purpose. There are several possible solutions to this dilemma and in consequence it is less easy to see the most beneficial path to tread but it is clearly a subject to which both exhibition authorities should give the closest thought.

BRITISH STANDARD CODES

From the spate of bright ideas that emerged in the early 1940s on post-war planning, the publication of Codes of Practice has come to stay. The intention to provide guidance on the best techniques for the installation and operation of plant was admirable and in consequence it was perhaps only to be expected that some of the earliest documents showed unmistakable signs of over-enthusiasm. More recently there has been some sobering down and the Codes are now providing a useful guide to the practices of the engineering and building industries. The preparation of the Codes has hitherto been the responsibility of the Ministry of Works but publication of the Codes has largely been in the hands of the B.S.I. Now as a result of the recommendation of the Cunliffe committee the whole of the work is to be taken over by the B.S.I. and the preparation of the Codes will now conform with the Institution's well-known formula. Few will query the wisdom of this step since the two types of publication

Electricity Supply Handbook

The 1954 edition of this handbook is now available. In addition to complete revision of the contents, particulars have been included of the plant in steam power stations. Copies price 5/- each may be obtained from the Offices of the "Electrical Times."

are largely complementary but there is one important difference between them that should not escape consideration. British Standards, from the nature of their content, have an appeal mainly to manufacturers and in their preparation most firms concerned will know of the intention to publish a standard and perhaps have played a part in its formulation. Codes of Practice, however, have a much wider appeal and if they are to have the maximum effect their message must be passed down to every man on the job. This is no mean task of publicity and we are not at all sure that it has yet been tackled satisfactorily.

MEASURING IRON LOSS

After all the work done on the measurement of iron losses, during the past fifty years, it is somewhat surprising to find that the last word on the subject has yet to be said. Such at least is the impression gained from Professor Brailsford's paper presented to the I.E.E. last week. He found no fault with existing methods of testing samples; his main object was to derive the source of errors which occur when practical measurements using the two or three wattmeter methods are made on three-limbed transformer cores. Such measurements are a routine test in many works and it is consequently remarkable that hitherto little work has been done to estimate the value and investigate the cause of the difference between the calculated and the practical values of iron loss. Using wattmeters of substandard or first-grade accuracy, such errors can be of the order of 2 or 5½% respectively, at maximum flux densities of 13,500 gauss. Admittedly, the effect of these errors on the overall performance of a large transformer is small, but, as the paper points out, with the introduction of higher grades of hot-rolled silicon-iron the discrepancy between the measured iron loss and the calculated iron loss tends to increase, and a similar effect occurs as flux densities are made larger. In these circumstances, in order to be able to judge the true value of the improved material it becomes of importance to be able to estimate the errors in measurement which may occur, small though these may be with regard to the overall efficiency of the transformer.

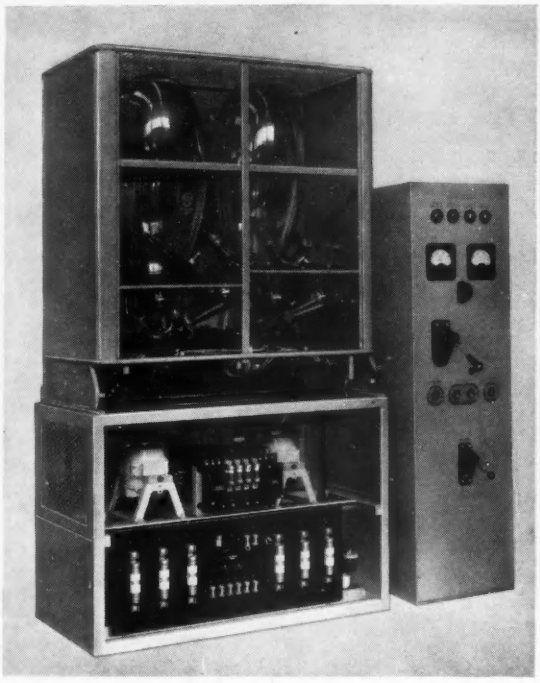
FUEL CELL PROGRESS

Historically, the hydrogen-oxygen fuel cell has an honoured place in electrical technology, dating back to Grove's experiments in 1839. At that time, the only metal suitable to act as electrodes was platinum, and the expense of construction, together with the lack of knowledge of the mechanism of catalysis caused the cell to remain for many years no more than a scientific curiosity. Work on the development of catalysts over the past thirty years, however, has awakened interest in the cell and the technique has now progressed to a point where it can be considered as a practical chemico-electrical converter. Even so, much work remains to be done before it can approach to the point of everyday use; but there is ample reason to suppose that the remaining problems are amenable to solution. According to Mr Bacon, whose recent E.R.A. work on the subject has just been made generally available, the main advantages of the cell are lightness, compactness, high-efficiency and overload capability, and he suggests that these properties make the cell particularly suited for electric rail traction over non-electrified lines. Such a suggestion is of course founded on the assumption that a heavy power form of cell can be developed, and even in this event, the economics of fuel-cell utilisation will be complex. Major factors will of course be the cost and efficiency of the electrolysis plant for producing the necessary oxygen and hydrogen but if, as may be possible, commercial gas mixtures and atmospheric oxygen could ultimately be used, the fuel-cell could become an important factor in the industrial world.

RATING WELDING PLANT

The question of the rating of arc welding plant has always been troublesome. As far as hand welding is concerned, the process is essentially intermittent—the operator has to examine and peen the weld at intervals, and has periodically to replace his rods. Any form of rating, based on maximum continuous welding current, is therefore not truly representative of the duty imposed on the welding plant in practice. This has long been appreciated; and indeed many firms producing welding plant have adopted the practice of providing controls whereby currents considerably in excess of the rated maximum can be drawn. Such a situation is obviously unsatisfactory both to the plant manufacturer and the user. An important step toward a more rational basis has, however, now been made by the issue of a revised British Standard 628:1954. Here, for the first time, a modifying term "arcing time factor" is introduced. This factor is somewhat lengthily defined as the "ratio of arcing time to total time the supply is available for the arc, with a maximum continuous arcing period not exceeding three minutes." A maximum value of 0·75 for manual welding has been established as a suitable value for this factor, but it has also been borne in mind that such a figure is rarely attained in practice. Provision has also been made in the standard for a type of equipment which when operated at a lower arcing time factor than 0·75 can provide currents in excess of the maximum continuous hand welding current. The introduction of these changes will serve to place the rating of welding plant on a more practical basis than has hitherto been the case, and the new standard should be of considerable value to users of such equipment.

Meteor



Voltage-Current Relationships in Rectifier Load Circuits

CURRENT CONTINUITY AS DECIDED BY CIRCUIT CONSTANTS AND THE EFFECT ON OUTPUT VOLTAGE—PART I

By R. WELLS,* A.M.I.E.E.

THE output e.m.f. of a rectifier depends for its wave shape upon the number of secondary phases and the degree of anode firing delay. The wave shape is not, of course, the conventional straight line; it is undulating though unidirectional. The e.m.f. which it represents appears between the rectifier cathode and the transformer neutral, and in the general case it may be applied to a circuit containing all three circuit parameters, resistance, inductance and capacitance, together with a back e.m.f.

It is the object of this article to show some of the effects which circuit parameters may have upon the wave form of the output e.m.f. and upon rectifier regulation curves. However, although resistance and inductance are taken into account, it is not proposed to consider the effects of capacitance. This course is taken because although circuits having large values of electrostatic capacitance can give rise to discontinuous currents, they are rather special cases and require separate treatment.

Typical Results With a Resistance Load

The best way to demonstrate the effect of inductance upon the output characteristic of a rectifier is to carry out a test with and without a choke connected in the load circuit, but without the complication of a back e.m.f.

Fig. 1 shows a typical family of output regulation curves taken at various values of anode firing delay. The rectifier used to obtain these curves was connected three phase star and the phase to neutral voltage was 140 V r.m.s. on open circuit. From this set of regulation curves the following points may be noted.

Results with No Choke

The five curves taken at the various values of anode firing delay without a choke in circuit, all display a voltage drop from zero to 100% load which is materially the same. These curves represent a basic condition with the whole of the circuit between rectifier cathode and transformer neutral being purely resistive, and the voltage drop which takes place is simply due to the transformer impedance. This voltage drop remains equal for all five values of anode firing delay in spite of the fact that at 0° and 20° the d.c. voltage and current are continuous, whereas at 40°, 60° and 80° they are discontinuous. The explanation is as follows: whether the load current is continuous or discontinuous, the transformer phase currents are always discontinuous. Since the voltage drop that takes place in the conditions considered is due to transformer impedance, the drop remains constant.

The next point to note concerns the values of open circuit voltage. In the absence of arc voltage drop this rectifier would give an open circuit d.c. voltage of 163·3 at 0° firing delay, 150·5 at 20°, 124·8 at 40°, 93·1 at 60°, and 59·4 at 80°. In actual fact it gives 144, 130, 111, 81 and 53 respectively. This means that the effective arc voltage drop (which is the difference between these figures) becomes 19·3 at 0° firing delay, 20·5 at 20°, 13·8 at 40°, 12·1 at 60°, and 6·4 at 80°. Thus at 0° and 20° anode firing delay (where the rectifier output e.m.f. is continuous) the arc drop has the usual value of about 20 volts. As the anode firing delay increases in the discontinuous range however, the effective arc voltage drop becomes less. The reason is that whereas each separate arc will have the usual voltage drop of about 20 during the time it is firing, the arcs collectively do not fire the whole time, so that the effective average drop for the whole cycle becomes lower as the degree of discontinuity increases.

Choke in Circuit

The five curves taken with a smoothing choke in circuit (choke reactance 3·85 ohms at the supply frequency of 50 c/s) present a different picture. However, the introduction of this smoothing choke does not affect the open circuit voltage at all. This means that a choke carrying zero current cannot influence the voltage relationship.

At 0° and 20° anode firing delay (where the conduction is continuous in any case) the presence of the choke has

*Hackbridge and Hewittic Electric Co., Ltd.

made no difference to the voltage regulation at all. In actual fact, the result of introducing inductance into a rectifier load circuit which is already carrying a continuous current is merely to smooth the current without affecting the average value of either voltage or current—apart from introduction of the resistive volt drop of the choke, which it is proposed to neglect.

The regulation curves applicable to 40°, 60°, and 80° anode firing delay with a choke in circuit, are characterised by an initial slope which is steeper than when no choke is present. Whereas inductance has been introduced into the load circuit, its effect is too small in this region. (due to the low current) to make the conduction continuous. As a result, a discontinuous current flows in the choke, the separate pulses of this current being each in turn derived from a transformer secondary winding and carried by an anode. The effect is equivalent therefore to that which would be obtained if three such chokes were connected, one in each of the three anode circuits: the full reactance of the choke is added to the leakage reactance of the transformer to give a higher reactive drop at any particular value of current, and hence a steeper regulation curve.

Two of these three regulation curves reach a transitional point where the initial slope is lost—this point coinciding with a change from discontinuous to continuous conduction. The voltage regulation from this point up to full load is very small. The choke in bringing about continuous conduction has reached the maximum of its ability to lower the d.c. voltage. Increasing currents now enable the transformer (by virtue of that component of its inductance which may be referred to the load circuit) to gradually take over this function from the choke. The voltage regulation curve becomes practically level not because the transformer suddenly loses its impedance, but because the increasing voltage drop due to transformer reactance is matched by a corresponding decrease of the voltage-lowering effect of the choke; only resistive voltage drops remain. Therefore no further decrease in d.c. voltage will take place (apart from that due to transformer resistance) until the load has reached a value where the volt drop due to the transformer is equal to that which was caused by the choke at the transitional value of current i.e. where the regulation curves with and without a choke converge. From this point of convergence onwards (outside the current range of Fig. 1) the regulation curve would go on at the slope governed by the transformer impedance and the current would be continuous even without a choke.

The third regulation curve (corresponding to 80° anode firing delay) drops to zero volts with the conduction still discontinuous, and the reason for this is explained later in the article.

Effect on Voltage Waveforms

A somewhat peculiar set of conditions will now be considered. The points E and D on Fig. 1 both correspond to 60° anode firing delay and to 100% load. At E the d.c. voltage is 70, but the introduction of the choke causes the d.c. voltage to drop to 54 at D, although the current through the choke is continuous, and in spite of the fact that even if this current were discontinuous, the choke could not develop across its own terminals a voltage drop having an average or d.c. value. Measurements with a moving coil voltmeter confirm that the average volt drop across the choke is only the very low resistive value, and they also show the d.c. voltage to be 54 on both rectifier and load sides of the choke. The conditions described in the foregoing are shown diagrammatically in Fig. 2 in which it is assumed that the smoothing choke has zero resistance.

The choke then, although it can by its introduction (under these conditions) cause a diminution of the load voltage and hence current, should *not* be viewed as a circuit component which can alter conditions by its own series volt drop, but rather as one which can actually lower the average value of the voltage as it appears between the rectifier cathode and transformer neutral.

The mechanism by which the choke can lower this voltage may be explained as follows. (See Fig. 3.) If the circuit between cathode and neutral were purely resistive, then the output voltage for (by way of example) a three-phase rectifier operating at 60° anode firing delay would follow the line BCJDF^{1}F^{2}F^3 and would therefore be of zero value from D to F^3. The introduction of inductance enables the conduction to continue during the

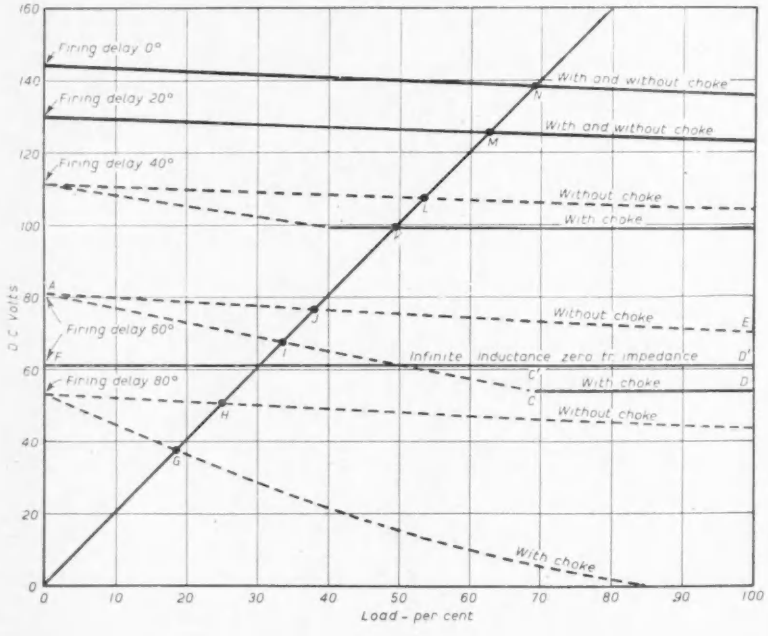


Fig. 1. Regulation curves for a three-phase rectifier on resistance load. Open-circuit secondary volts 140 r.m.s. phase to neutral. Choke reactance 3·85 ohms at 50 c/s. Continuous lines, continuous current; discontinuous lines, discontinuous current. The diagonal line is the volt/amp characteristic for a 10 ohm load where full load current is 20 amp

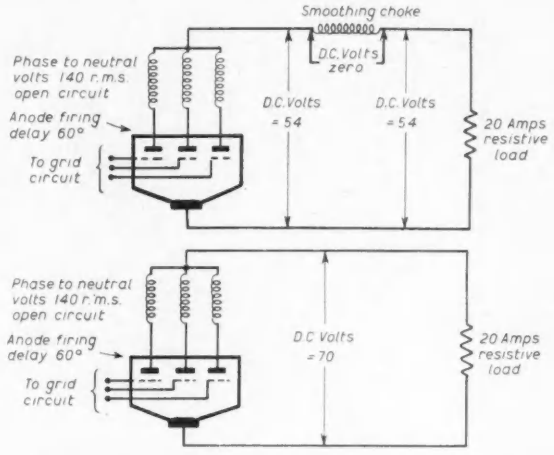

Smoothing choke
D.C. Volts zero
Phase to neutral volts 140 r.m.s. open circuit
Anode firing delay 60°
To grid circuit
D.C. Volts = 54
D.C. Volts = 54
20 Amps resistive load
Phase to neutral volts 140 r.m.s. open circuit
Anode firing delay 60°
To grid circuit
D.C Volts = 70
20 Amps resistive load

Fig. 2. Conditions described in analysis of performance with resistance load, with and without choke

time the transformer voltage is negative so that increasing values of inductance and/or current can change the voltage, for example, from BCJDE^{1}F^{1}F^{2}F^3 to BCJDE^{2}F^{2}F^3. Due to the fact that the next anode commences its conduction at G, however, there is a limit to this effect when the voltage becomes BCJDE^{1}E^{2}E^{3}F^3 and the possible negative area is fully taken up to bring about the maximum diminution of average volts. Having reached this condition then a further increase of current through a particular value of inductance causes no further increase of volt drop.

It is of interest to note that during the time when conduction extends into the region of negative voltage the current is still flowing in the d.c. circuit in the usual direction from cathode to neutral (this of course being the only direction in which it can flow). This means that we have inversion taking place during this part of the cycle, with the choke giving up energy, some of which is returned to the a.c. mains and the remainder to the load. As far as oscillations of choke energy level are concerned, we have two different conditions. Where the rectifier e.m.f. is discontinuous, the choke derives energy from the a.c. mains and then, in giving up energy, imparts sufficient to the load to make the conduction continuous and returns the surplus to the a.c. mains by means of an instant of inversion. Where the rectifier e.m.f. is continuous the choke derives energy from the mains and then gives it up to the load to make the current smoother, and in so doing leaves no surplus.

Having seen then that the introduction of a choke into a load circuit operating with a discontinuous e.m.f. results in the voltage at the rectifier d.c. terminals (i.e. cathode and transformer neutral) having negative as well as positive lobes, it is of interest to consider the effect upon the load terminal voltage. If the load consists of a resistor (or a back e.m.f. and a resistor) the passage of a unidirectional current precludes the possibility of the load terminal voltage (i.e., that on the load side of the choke) being anything but wholly positive. This voltage, however, although wholly positive, will have the same average value as the rectifier terminal voltage between cathode and neutral (which has been reduced in average value by the negative lobes) because the choke cannot cause a series volt drop. It will be then approximately as BJKF^3 on Fig. 3 and it will have an area equal to that of BCJD less that of DE^{3}F^3 The current wave shape (for a resistance load) would also be as BJKF^3. If the load itself was inductive and there was no separate choke then the rectifier-cum-load voltage would be as BCJDE^{1}E^{2}E^{3}F^3.

Transition Points

The significance of the value of the voltage at which the regulation curve levels out (Fig. 1) can be explained as follows: It is usual in rectifier theory to put forward two curves relating d.c. output voltage to angle of anode firing delay. The first covers the case of a non-inductive load and follows the law

$$V_d = V_{d_o} \cdot \frac{1 - \sin\left(\alpha - \frac{\pi}{P}\right)}{2 \sin\frac{\pi}{P}}$$

The second covers the case of infinite load circuit inductance and follows the law $V_d = V_{d_o} \cos \alpha$. These two curves are shown on the Figs. 4 to 7 and are marked respectively DC and DE.

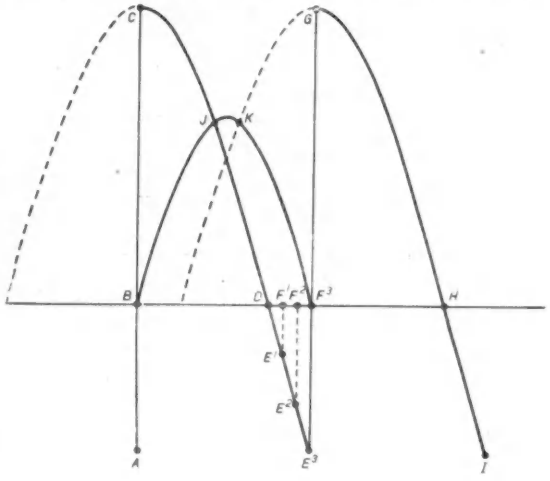
The first curve covering a non-inductive load can be given a useful meaning by stating either that it applies to the no-load condition *or* that it assumes a transformer of zero impedance. The second curve covering the case of a load of infinite inductance cannot really apply to the no-load condition, however, because the first covers this condition, and because as we have already seen an inductance carrying zero current cannot influence the voltage relationship. An infinite inductance, however, will produce its effect at an infinitesimal current and since it has been found that there is a limit to the voltage-lowering effect which an inductance can bring about, this second curve may be said to apply to all loads from infinitesimal upwards provided we neglect transformer impedance.

If now the regulation curve corresponding to this theoretical condition of infinite load circuit inductance but zero transformer impedance is shown, for example, as it would apply to our case at anode firing delay 60° it will be as AFD′ on Fig. 1, where the value of voltage at A is

LIST OF SYMBOLS

V_{d_o}.	No-load d.c. voltage at zero firing delay, neglecting arc voltage drop.
V_d.	No-load d.c. voltage at firing delay α, neglecting arc voltage drop.
α.	anode firing delay.
P.	number of phases.

Fig. 3. Voltage wave forms for a three-phase rectifier operating at 60° anode firing delay. BCJDF^3, voltage when cathode to neutral circuit is wholly resistive. BCJDE^{3}F^3, voltage cathode to neutral with resistive load and separate choke, or with inductance in load. BJKF^3, voltage at terminals of a resistive load when using choke smoothing



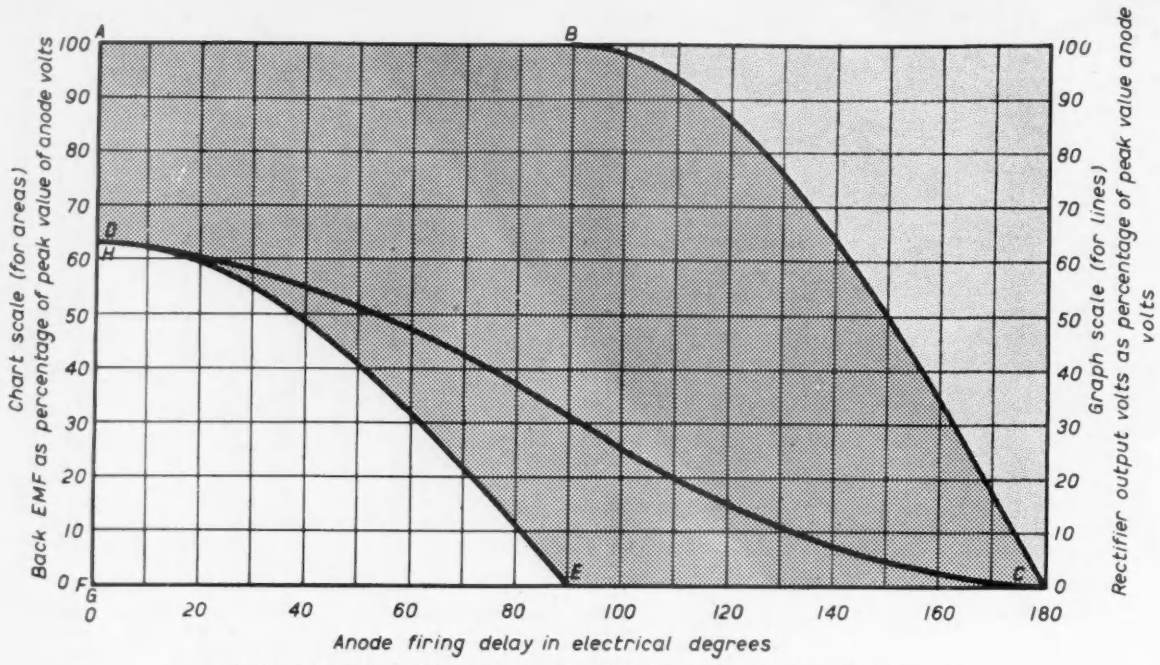


Fig. 4. Chart for bi-phase grid-controlled rectifier with load containing a back e.m.f. component

obtained from the curve DC on Fig. 5 (less partial arc drop) and the value of voltage at F is obtained from the curve DE (less the full arc drop). It will be seen then that the steep part of the regulation curve extends to the point at which it is below this theoretical regulation line by an amount equal to the voltage drop at the same value of current on the basic resistance load curve AE (Fig. 1). At this voltage the regulation curve levels out so that the line CD is below the line C′D′ by a voltage equivalent to the voltage drop caused by the transformer impedance alone at load CC′ i.e. at 69% load in the example.

From the foregoing it will be appreciated that if the inductance of the choke was of such a value as only just to

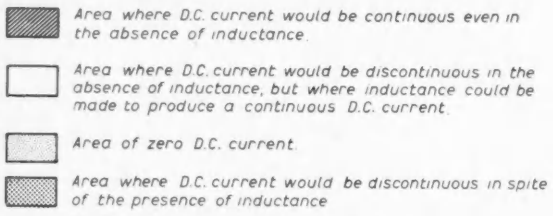
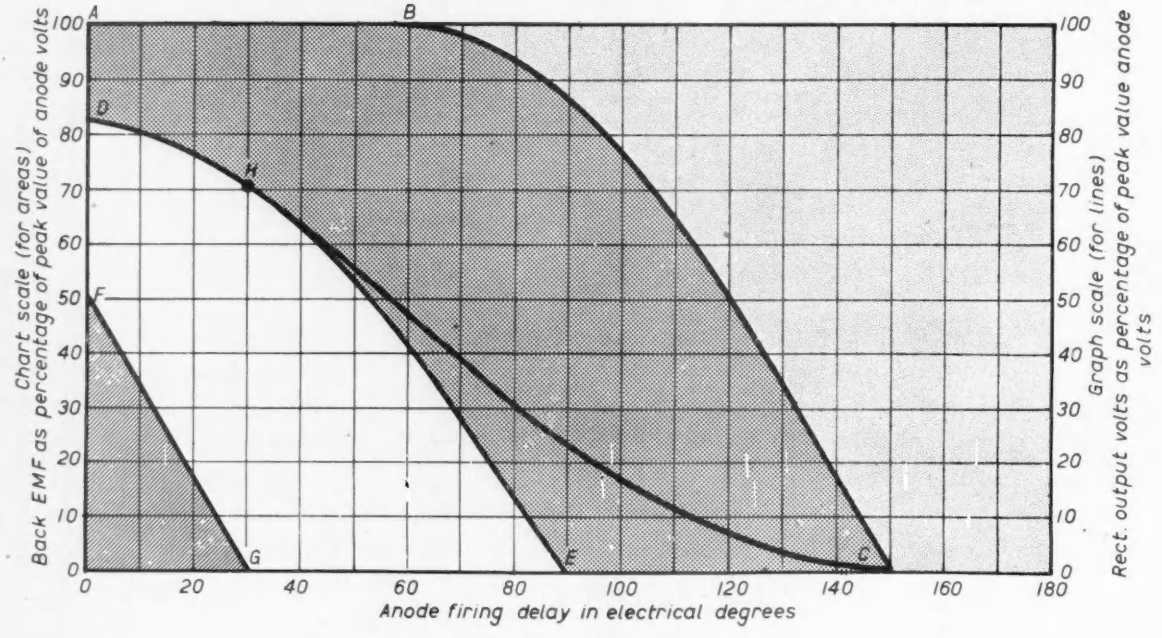

Area where D.C. current would be continuous even in the absence of inductance.
Area where D.C. current would be discontinuous in the absence of inductance, but where inductance could be made to produce a continuous D.C. current.
Area of zero D.C. current.
Area where D.C. current would be discontinuous in spite of the presence of inductance

Fig. 4a. Key to Figs. 4 to 7. In each chart ABC is the line of variation of instantaneous maximum voltage; DC, the line of variation of average volts with resistive load; DE, the line of variation of average volts with inductive continuity. FG, variation of instantaneous minimum voltage

Fig. 5. Chart for three-phase grid-controlled rectifier with load containing a back e.m.f. component



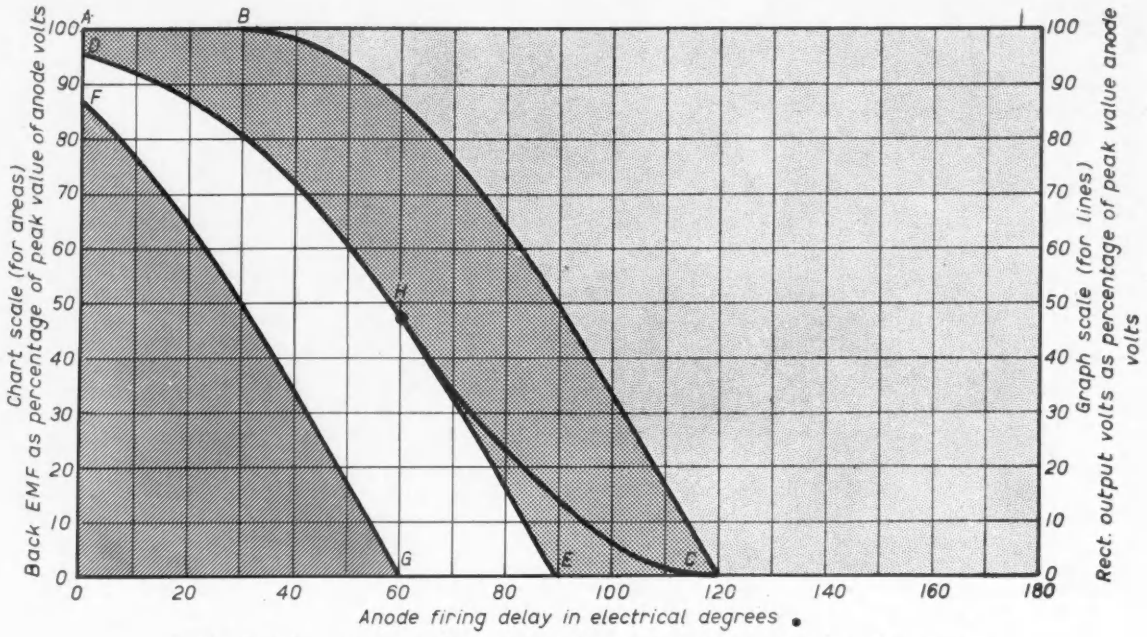
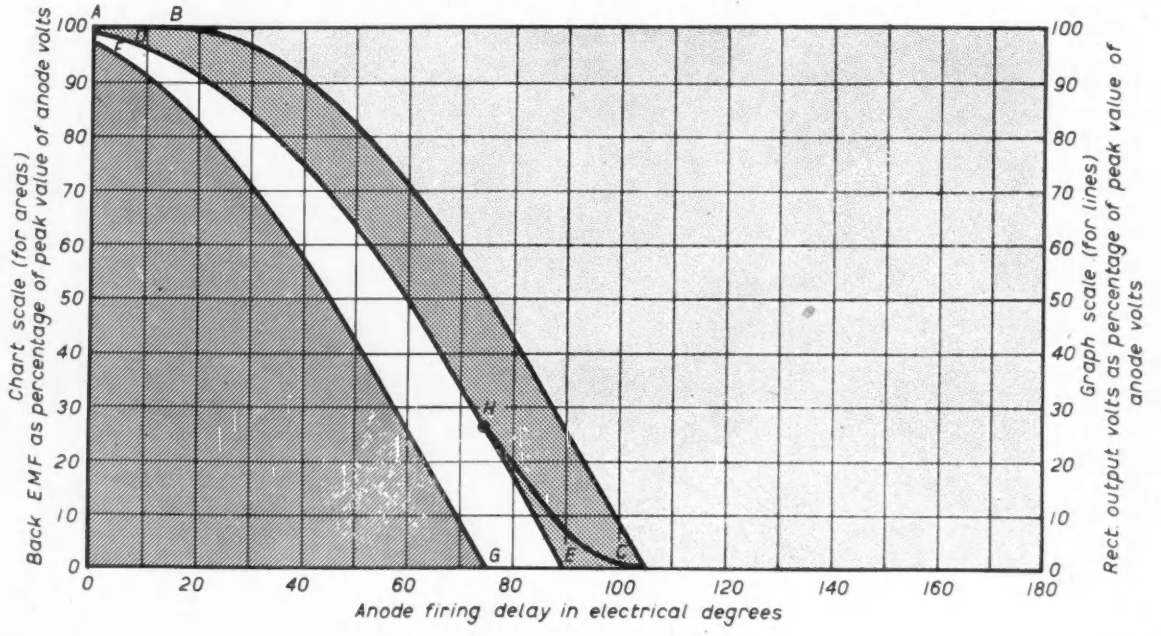


Fig. 6. Chart for a six-phase grid-controlled rectifier with load containing a back e.m.f. component

produce continuity at full load, it would cause the full load d.c. voltage to be lower than it would be with a very large choke by an amount equal to the basic regulation drop due to transformer impedance. Thus, not only can a load circuit choke bring about a diminution of voltage without having a d.c. voltage drop, but the amount of the diminution is dependent upon the inductance of the choke, and may be varied over a range equal to the voltage drop as caused by the transformer impedance.

It will now be clear why the regulation curve corresponding to 80° anode firing delay (Fig. 1) drops to zero volts before full load and with the conduction still discontinuous. Neglecting transformer impedance and arc losses the output drops from the curve DHC (Fig. 5) to the curve DHE at the current value which brings about continuity. If this occurs before full load, the regulation curve levels out at the voltage value as curve DHE; if it does not occur before full load the conduction remains discontinuous and the average voltage is between the value of curves DHC and DHE. If now we take transformer impedance and arc losses into account, the full load current can bring about a voltage drop below the curve DHE and there will be a certain delay angle where the curve DHE has a value equal to this full load regulation drop (79° in our example). If now we operate the rectifier at this delay angle, full load current will just

Fig. 7. Chart for a twelve-phase grid-controlled rectifier with load containing a back e.m.f. component



produce current continuity at zero average volts output. At larger delay angles the voltage will fall to zero at currents less than full load but the current will remain discontinuous. Even neglecting normal regulation effects, current continuity cannot be achieved at angles of firing delay greater than 90° and the output would drop from curve DHC to line EC with zero average volts output.

Predetermination of the Regulation Curve and the Load Operating Point in the Absence of Back e.m f.

Figs. 4 to 7 of this article can be used to predetermine the voltage regulation and the load operating point of a rectifier providing certain information is available. The information required is the transformer commutating reactance and resistance, the reactance of any anode chokes which may be present, the arc volt drop, and the characteristic of the whole load circuit, including resistance, inductance and back e.m.f.

1. Select the chart from Figs. 4 to 7 appropriate to the number of phases.

2. Read off the theoretical voltage from the curve DC appropriate to the angle of anode firing delay.

3. Subtract from this voltage the arc volt drop of the rectifier to obtain the open circuit voltage—making use of the chart to determine whether the open circuit voltage will be continuous or discontinuous. If continuous subtract the full arc drop, and if not, make allowance for the fact that with a discontinuous open circuit voltage the arc voltage drop is going to taper off from the full value when only just discontinuous to zero when almost fully discontinuous.

4. If the load is resistive the regulation curve may be completed by calculating the full load voltage drop in the usual way, i.e. from a knowledge of the transformer copper loss and its commutating reactance complete with anode reactors, if present.

5. If the load itself is inductive or if there is a smoothing choke present it is a good idea to complete the resistive regulation curve as above before proceeding.

6. If it has been established that the open circuit voltage is continuous then the regulation curve for an inductive load will be the same as that for a resistive load.

7. If it has been established that the open circuit voltage is discontinuous proceed as follows: (*a*) From the curve DE determine the open circuit voltage as for the case of infinite inductance and draw the level regulation curve to correspond, making allowance for the full arc drop—if necessary this line may be sloped to take into account the voltage drop due to transformer resistance. (*b*) Assume that each secondary phase has connected in it an inductor of the same value as that associated with the d.c. circuit. (*c*) Determine the commutating reactance, complete with these assumed inductors and determine the volt drop at several values of load. (*d*) Draw the steep part of the regulation curve using the open circuit voltage already determined at (3) and the points obtained from the above. Continue this curve below the line (as obtained at (*a*)) by an amount equal to the volt drop of the basic resistive curve as obtained at (4)) at the same current. (*e*) Correct the steep part of the regulation curve having in mind that the arc voltage drop will change from whatever value it has at no-load to its full value at the transitional point of the regulation curve i.e. where it meets the level part of the curve.

Using the above method the regulation curve of the rectifier may be constructed—it remains to be noted that if the volt/amp characteristic of the load be plotted on the same graph the points of intersection will give the actual value of load volts and amps in average values and it shows at the same time whether the current is continuous or discontinuous. This has been done on Fig. 1 at GHIJKLM and N for a 10 ohm load on a rectifier rated for 20 amps full load.

General Effects of Back e.m.f.

If we neglect resistance and inductance and consider only the effect of applying a non-linear voltage from the rectifier to a linear back e.m.f. we shall be able to establish whether the conduction is inherently continuous, inherently discontinuous, or non-existent, by an application of three criteria. First, if the back e.m.f. is lower than the instantaneous minimum of the rectifier output voltage, then the load current will inherently be continuous. Secondly, if the back e.m.f. is higher in value than the instantaneous minimum of the rectifier output voltage, but lower than the instantaneous maximum, then the load current will be inherently discontinuous. Thirdly, if the back e.m.f. is higher in value than the instantaneous maximum of the rectifier output voltage then the load current will be zero.

Now the usual well-known graphs, which show the relationship between d.c. output voltage and anode firing delay of grid-controlled rectifier when feeding a purely resistive load and when feeding a load of infinite inductance (which have already been mentioned and which are shown on Figs. 4 to 7 as curves DC and DE respectively), deal, of course, with the average value of d.c. voltage, which would be indicated on a moving coil voltmeter. They in no way show the wave-form or the wave-form variation of this voltage with anode firing delay. These graphs, then, are of no use for the purpose of applying the foregoing criteria. On the other hand a graph which does show the variations in value of instantaneous minimum and maximum can be used as the basis for a chart to illustrate the conditions which give rise to inherently continuous, inherently discontinuous, and zero conduction.

Four such charts are introduced, for the bi-phase connection as Fig. 4, the three-phase connection as Fig. 5, the six-phase connection as Fig. 6, and the twelve-phase connection as Fig. 7. These charts, which are shown with anode firing delay as the abscissa, have been constructed neglecting arc voltage drop. The percentage ratio between back e.m.f. and peak value of anode volts ($\sqrt{2}$ times phase to neutral volts) has been used for the "chart" ordinate on the left. The percentage ratio between the various values (instantaneous maximum, average and instantaneous minimum) of rectifier output volts and peak value of anode volts, has been used for the "graph" ordinate on the right. The charts are divided into areas by the curves corresponding to the variation of minimum instantaneous output voltage (FGEC), and to the variation of maximum instantaneous output voltage (ABC). The areas correspond to inherent continuous conduction, inherent discontinuous conduction, and zero conduction.

The area of inherent discontinuous conduction is then sub-divided by the curve DE into areas where inductance can bring about continuity (back e.m.f. lower in value than rectifier average output volts with inductive continuity) and where inductance cannot bring about continuity (back e.m.f. greater in value than rectifier average output volts with inductive continuity).

Chart Characteristics

The salient points to note in connection with these dividing lines are five in number. First, the line of variation of maximum instantaneous value remains at full value for a change in angle of anode firing delay corresponding to π/P, i.e. 90° for bi-phase, 60° for three-phase, 30° for six-phase, and 15° for twelve-phase. Secondly, this same curve then follows a cosine law in each case

and therefore reaches zero value after a further change of $\pi/2$ in delay angle.

The third point concerns the overall value of anode firing delay necessary to reduce the value of the instantaneous maximum down to zero. This becomes 180° for bi-phase, 150° for three-phase, 120° for six-phase, and 105° for twelve-phase connections, i.e. the same angles as required to reduce the average volts to zero in the case of a purely resistive load, as the curve DC shows. Fourthly, the line of variation of minimum instantaneous value follows a part cosine law in such a way that the overall value of anode firing delay necessary to reduce its value to zero is $\pi/2-\pi/P$, i.e. 0° for bi-phase, 30° for three-phase, 60° for six-phase, 75° for twelve-phase. The fifth and final point is that the curves DC and DE diverge at H, which point corresponds to the angle of anode firing delay $\pi/2-\pi/P$ where the rectifier output voltage first becomes discontinuous.

Now where the conduction is found to be inherently continuous the rectifier regulation curve remains the same as the resistive curve. The effect of inductance is simply to make the current more smooth, and the current value may be calculated direct from rectifier volts, back e.m.f. and resistance, no matter which of these three quantities is varying so as to bring about current variation. In practice such conditions as this are usually only found in the case of a free-firing, resistance-controlled battery charger.

(To be continued)

Orlando Station Extensions

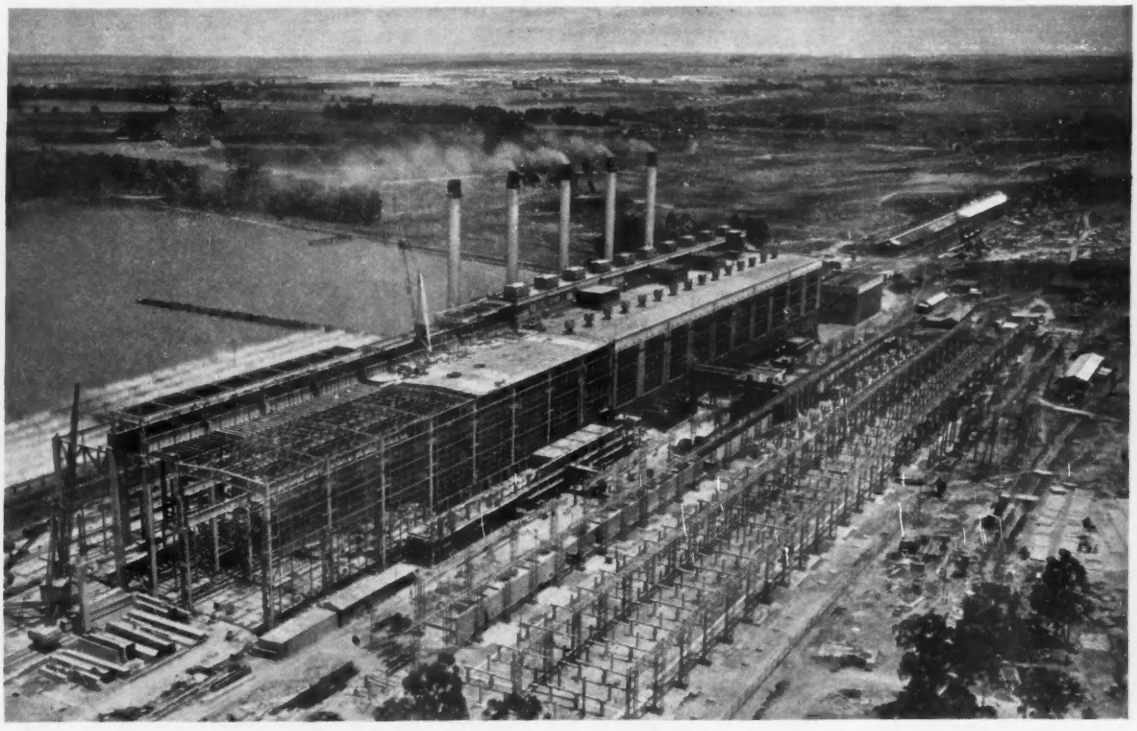
In 1936, the growing needs for electricity in the Johannesburg area made it necessary to consider the provision of a second power station to supplement the existing City Generating station. The site selected, about nine miles from the city, allowed ample room for expansion and was well provided with railway facilities, and water supplies.

The first contracts were placed in 1938, for two 30 MW turbo-alternators and five 175 klb/hr boilers, but long before these were in operation, orders had been placed for a further 30 MW set and another boiler. Although permission was given during the war years for the plant to be shipped, bad luck dogged the early units. Two ships were sunk by enemy action and a large proportion of the generating plant was lost. It was not until 1942 that the first set and two boilers came into service; toward the end of 1943 the second set was installed and the third in the middle of 1946, to complete the first stage.

Demand continued strong in the area, and a further extension was begun consisting of two more 30 MW turbo-alternators and four more boilers, making five sets in all. Work on this project began in 1948, but it was soon realised that even this would not be sufficient, and in 1949 a further and final extension was decided upon, doubling the size of the station.

The photograph below shows the state of the plant at the moment. When this last extension has been completed the station will consist of ten G.E.C. sets, each of 30 MW m.c.r. rating. The first five of these sets have an overload rating of 37·5 MW for one hour. Steam conditions are 625 lb/sq in. at 850° F and the steam will be supplied from twenty Babcock and Wilcox boilers each rated at 175 klb/hr. The work has now progressed to a stage when six sets and twelve boilers are in use. The extensions to the station have been great enough to outstrip water supplies and two cooling towers are being built to handle circulating water.

The latest picture of Orlando showing the final extension under construction in the foreground



The Hydrogen-Oxygen Reaction

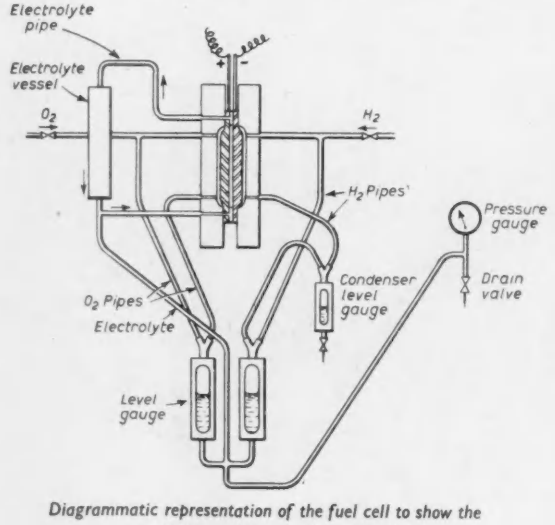
Recent Work on Fuel Cells Released by the E.R.A.

As far back as 1839, Sir William Grove described the hydrogen-oxygen cell, and by 1889, Ludwig Mond and Charles Langer, had so far developed this form of electro-chemical reaction that a current density of 6 amps/sq ft at 0·73 V was attained. This performance corresponded to a useful efficiency (based on the total heat of the reaction) of nearly 50%. At that time, the only suitable catalyst was platinum which in its spongy state had the large area for gas adsorption. The high cost of platinum at that time, however, precluded further work with the metal, and research was consequently dropped. In the following years, large numbers of base metal catalysts were developed for use in the chemical industry, the cost being much lower than that of platinum.

In 1932, Mr F. T. Bacon, author of the E.R.A. Report "Research into the properties of the Hydrogen-Oxygen Cell," began a renewed attack on the subject. The H-O cell was selected in preference to others as it appeared probable that it could first be developed for use on a small scale, as a kind of storage battery, using gases produced electrolytically from water. This might make possible the economic storage of electrical energy on a larger scale than was available from accumulators, and at the same time might show substantial increases in the energy/weight and power/weight ratios making thereby a possible contribution to the use of stored electrical energy for traction purposes.

Basic Considerations

From the information then available it seemed likely that the best metal for both electrodes would be nickel or cobalt, although silver was a possibility for the O-electrode. It had previously been decided that an alkaline electrolyte, such as potassium hydroxide solution should be chosen, as the use of sulphuric acid, for example, would lead to possible corrosion of any metal parts, particularly at temperatures above normal. From the knowledge of the behaviour of catalysts it also seemed probable that with nickel electrodes, temperatures of about 200° C would be necessary to secure optimum results: with an aqueous solution this implied pressures well above atmospheric.



Diagrammatic representation of the fuel cell to show the arrangement of the hydrogen and oxygen feed system

It thus became obvious that the problem would need to be attacked fundamentally from an engineering point of view rather than from that of a pure chemist. It was also decided that before any applications could be contemplated, really high current densities of the order of at least 100 amps/sq ft would need to be obtained.

Work was not confined to this country. In 1947, for example, the results of work by O. K. Davtyan at the Academy of Sciences, Moscow, were published. The best results here showed a current density of 23-33 amps/sq ft.

Present Investigation

At the beginning of the investigation detailed in the Report, it was decided to use alkaline, rather than acid, aqueous electrolyte with a working temperature of about 200° C and a pressure of 600 lb/sq in. No rare metals should be used for electrodes, and commercially pure gases alone should be used. No moving parts, such as electrolyte pumps should be used and an output of 100 amps/sq ft at 0·8 V should be aimed at.

In 1938, a small glass apparatus was constructed, working at atmospheric pressure, on the lines of the original Grove gas battery. In this cell, the electrodes were of platinised platinum gauze and the electrolyte sulphuric acid. The cell operated at atmospheric pressure, but when nickel, activated by alternate oxidation and reduction at 700-750° C was tried in an electrolyte of caustic potash, poor results were obtained. In 1939, a cell was designed which would stand a pressure of 3,000 lb/sq in. and any reasonable temperature. The electrolyte was 27% caustic potash and the cell was lined throughout with pure nickel. Activated nickel gauges were used as electrodes and a current of 12·2 amps/sq ft obtained.

The Modern Cell

Further work was started in 1940 at Kings College, London, under the supervision of the late Prof A. J. Allmand. War-time difficulties intervened and research was suspended until 1946, when it was re-started at Cambridge and financed by the E.R.A. By 1948, a cell had been designed to give an output of 75 amps/sq ft at 0·65 V. This, however, was below the minimum aimed at, and it was subsequently decided that a new apparatus should be built using porous nickel electrodes, with the gases confined to the back of the electrodes. The porous nickel electrodes which are about 4 mm thick, are made with a pore size of about 30 microns on the gas side, and with a thin layer of much smaller pore size on the liquid side. A small pressure difference is set up in the apparatus across each electrode so that liquid can be expelled from the large pores on the gas side but gas cannot bubble through to the liquid side. It is thus unnecessary to use a diaphragm between the two electrodes—a great practical advantage.

The main cell parts are of steel, nickel-plated by the Fescol process, the two halves of the cell are bolted together with insulated bolts, and the cell is circular in shape with 5 in. internal diameter. Electric heaters are clamped to the outside of the cell and thermostatically controlled.

The best performance so far has been obtained at 240° C, 800 lb/sq in. Under these conditions, the performance is

Current density A/sq. ft.	0	151	384	670	1,000
Voltage	1·05	0·9	0·8	0·7	0·6

as shown in the Table reproduced above.

Making certain minor assumptions these figures give an energy efficiency (based on the free energy of the reaction) of 77% at 0·9 V and 68% at 0·8 V.

A gradual falling off in output occurred with time, and appeared due to gradual oxidation of the oxygen electrode. This phenomenon has proved the principle obstacle to further progress, but it is confidently expected that this can be overcome.

Future Possibilities

Problems which remain to be solved include the behaviour and construction of multi-cell units, the development of automatic gas admission valves which will maintain constant pressure in the cell at all conditions of load, a method for automatic removal of water produced by the reaction, an automatic device for maintaining constant temperature (using in large units internal energy losses) and manufacturing techniques for the construction of large porous electrodes.

The applications for the H-O cell, are of course bound up with its advantages. These are, first, the high efficiency of utilisation of the fuel which is greater than any heat engine. In certain applications the surplus heat from the internal losses might be put to good use. Ignoring this possibility, however, the cell thermal efficiency varies between 54% at 0·8 V to 67·5% at 1 V. Second, there is the ability of the cell to take large overloads at reduced efficiency—an important point in traction applications. Third is the silence, virtual absence of moving parts, and water-vapour exhaust. Fourth, the fuel would be produced from coal and finally, it is thought that the equipment would be both lighter and more compact than existing types of electrical accumulator. Taken as a whole, the fuel cell would probably extend the field of electrical storage rather than displace existing methods.

The main field of use suggested is for rail traction on remote lines where oxygen and hydrogen could be produced during off-peak hours by mains operated electrolysers and transferred to the locomotive by high pressure hoses. Another suggested application is where the power primary source is intermittent, such as wind power. It is not thought that large-scale production of power using oxygen from the air and hydrogen, chemically produced from coal is feasible, although possibly certain pure industrial gases composed of a mixture of H_2 and CO could be used in this way.

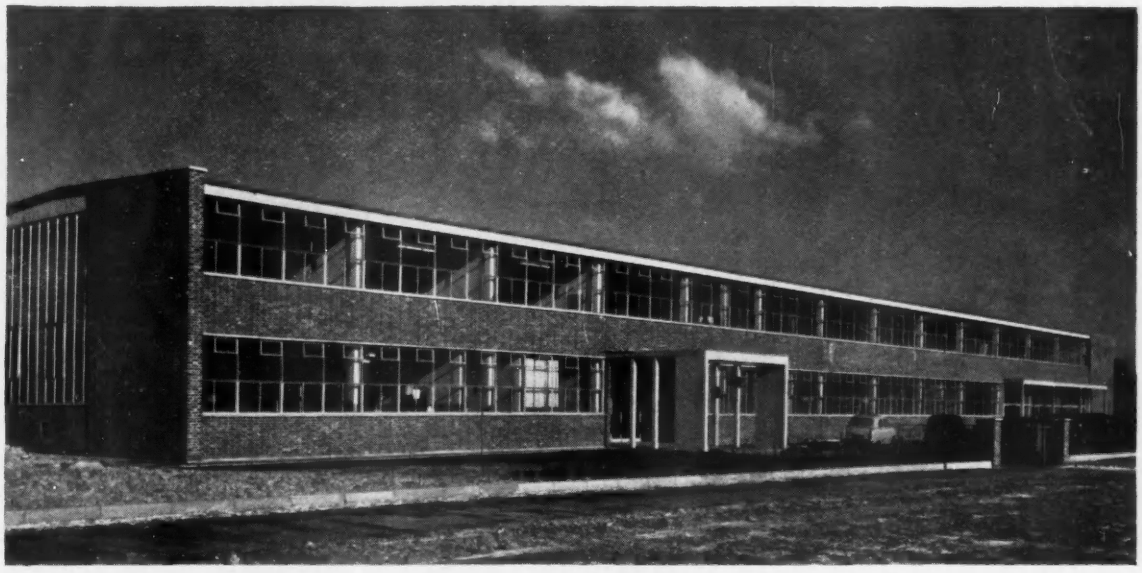
Limited copies of the report "Research into the Properties of the Hydrogen-Oxygen Cell" L/T94 are available, price 10s. 6d. from the E.R.A., Thorncroft Manor, Dorking Road, Leatherhead, Surrey.

New Factory for High Vacuum

W. EDWARDS AND CO. (LONDON) LTD, have recently opened a new works—Allendale Works, at Crawley. This move was caused by the increasing congestion at the old factory, coupled with the great demand for vacuum pumps and equipment. The total area of the new building is about 100,000 sq ft, of which 15,000 are for administration and 85,000 for factory space. The factory itself has been specially designed for the purpose of making vacuum pumps, both mechanical and vapour types and ancillary high-vacuum equipment.

The opening ceremony was performed by SIR BEN LOCKSPEISER who, speaking at the luncheon, emphasised the importance of vacuum technique to modern research and production. The electronic tube, the electron microscope, linear accelerators and various branches of metallurgical research all depended on high vacuum. The Rt. Hon. Lord Wilmot of Selmeston who proposed the toast of "The Guests" referred to the help they had received from the various government and local bodies. Prof E. N. da C. Andrade replied and recalled his early connections with the firm, and with high vacuum technology. Finally Mr F. D. Edwards had some pertinent words to say on the subject of present financial conditions and their effect on the future of research and development in this country.

Modernistic design is used in Edwards' new factory at Crawley, Sussex



READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Status of the Engineer

I AM glad that my first letter on the salaries and status of electricity supply engineers and technologists has incited such a vigorous correspondence in your columns. Mr J. W. H. Turner should appreciate that those who have long borne the "heat and burden of the day" in the struggle for improvements in the rewards of professional engineers are bound to be a little irritated by an assumption that nobody ever did anything until the Engineers' Guild arrived. However, I had no intention to go out of my way to criticise the Guild; my purpose was to point out that in public electricity supply the advancement of the interests of technical staff is realistically looked after by the E.P.E.A.

Mr Turner makes a common error in supposing that trade unions think only of material reward and are not concerned, for instance, with status and qualifications. The composition of the E.P.E.A. reflects accurately the composition of the technical staff of the Electricity Boards: the E.P.E.A. is made up of qualified engineers and of those who, lacking formal qualifications, are expected to do the work of qualified engineers. The proportion of chartered engineers in the E.P.E.A. will grow if the Electricity Boards insist more strongly on employing a qualified staff.

Mr J. W. Thomas's letter saddens me, respecting him as I do for his past work on behalf of engineers in electricity supply. Nobody, surely, would be so foolish as to suggest that the engineer in a managerial position should not be a competent administrator as well as a good technologist. Nor is it suggested, I hope, that the accountant, secretary and lawyer have not their legitimate place in the scheme of things.

The firm outlook of the E.P.E.A., however, is that in the same way as the man in charge of a great ocean liner is always a seaman, or the man in charge of a large hospital always a physician, so should those in charge of electrical undertakings be engineers. This is a simple enough principle, the truth of which is not destroyed because the A.M.E.E. runs away from it.

A. M. F. Palmer, A.M.I.E.E., M.P.
ELECTRICAL POWER ENGINEERS' ASSOCIATION
LONDON, S.W.1.

* * *

THE letter from Mr J. W. Thomas must surely be one of the most remarkable communications you have published for some time. He admits by implication, that the status of the engineer in the electricity supply industry has declined since 1948, but his assumption that this was inevitable with the growth of the industry will be regarded by engineers as an expression of frustration, if not defeatism.

According to Mr Thomas, it would appear that any attempt on the part of engineers to improve their conditions is to be regarded as an act of unkindness, if not hostility, towards others in the industry, and that in so doing they might be accused of setting themselves up as superior individuals.

It is obvious that your correspondent is a supporter of that false philosophy which has grown so popular in recent years, and which regards management as a profession in itself. The management of an industry should be in the hands of those most competent for the task, and in the electricity supply industry this is undoubtedly the engineer. I am not suggesting *ipso facto* that all engineers are suited either in temperament or ability for the managerial position but this in no way detracts from the principle. According to Mr Thomas the only hope for an engineer in his aspiration for advancement to the top lies in his abandonment of his engineering skill and his assumption of the title "professional manager," although he admits that he is unable to supply a yardstick by which managerial competency can be assessed.

I hope that any engineer who has hitherto had any doubts about the evils of joining a mongrel association attempting to represent the interests of all professions will have had these doubts dispelled by reading Mr Thomas's letter.

The fall in status of the engineer over recent years has been more serious than is generally accepted, and the disappearance of the old "Engineer and Manager" was a grievous blow to the profession and to the industry. It will require the considerable effort of all engineers concerned with this vital question to restore the position, and the result will not be achieved by the exposition of altruism and sentimentality from the secretary of the Association of Managerial Electrical Executives.

"Chartered Electrical Engineer."
BIRMINGHAM.

TV and Lightning

IS B. P. Meade, in his letter published in your issue of the 18th February, worrying more about the effects of lightning on the building or upon the TV set?

So far as the building is concerned, if the TV aerial is correctly installed and the pole and "non-current carrying metal-work" earthed, then the aerial reinforces the lightning protection. There is no objection to the support pole, etc., being connected directly to the lightning conductor earthing strip.

If danger of damage to the TV set is at issue, then provided the aerial is at all exposed, it is very likely to act as a lightning collector, if the building suffers a direct strike, irrespective of the proximity of lightning conductors, as it is reasonable to assume the discharge currents will be split up among all the conductors in proportion to their effective impedances, but again especially if the aerial pole and feeder cable sheath are earthed, then damage to the set is not inevitable, though the aerial may suffer.

These arguments are borne out by the fact that there is no evidence of any increased risks on houses equipped with TV aerials and damage to aerials and sets is very rare. Certainly no one need regard an aerial as a device to encourage lightning. The path of the discharge is influenced by things like columns of warm air, often from a chimney, existing far higher than any aerial.

A. Hale,
ENFIELD,
MIDDLESEX.

* * *

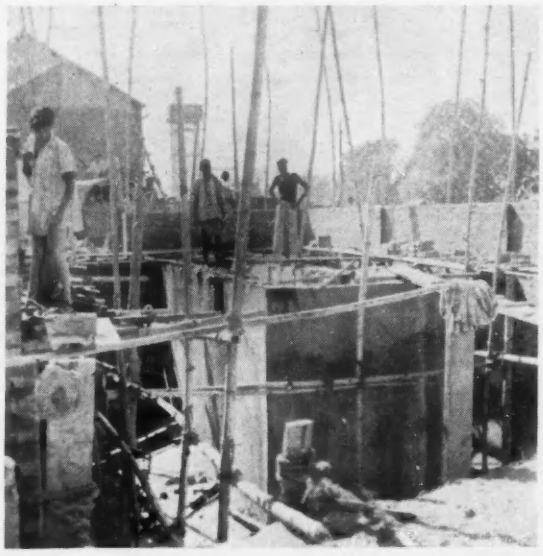
I DO not think that Mr B. P. Meade need unduly worry about the danger of lightning and TV aerials. In fact a lightning conductor generally operates as a discharging entity, and the presence of numerous aerials acting as lightning conductors is more likely to prevent the occurrence of a direct stroke to earth than to provoke it.

P. Clements,
LONDON, W.C.1.

Adamjee Jute Mills

PART II:—ELECTRIFICATION IN PAKISTAN: BY H. R. NIMMO, M.SC., B.E., A.M.I.E.E.

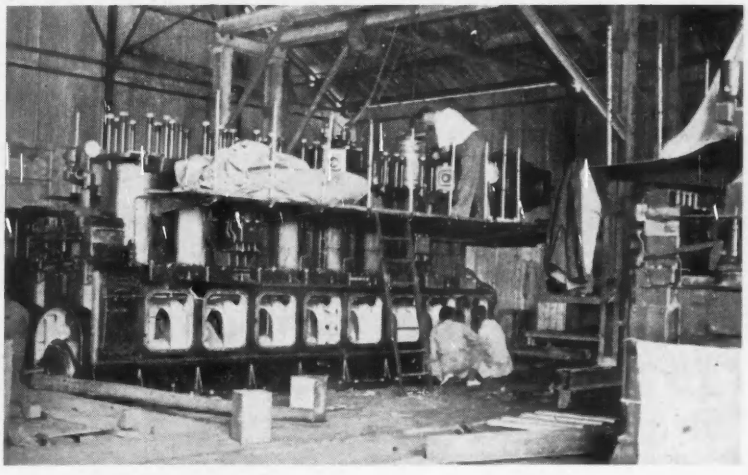
ON the 21st December, 1950, Liaquat Ali Khan, Prime Minister of Pakistan and the not unworthy wearer of the mantle of the father of the nation, Mohammed Jinnah, visited the site of the mills. It was decided that the date of the starting of the first mill should be on the first anniversary of this visit, 21st December, 1951. The Provincial Government had arranged that, until their plans for the building of a power house attained fruition, power would be supplied to the mills from a neighbouring cotton mill. This Dhakeswari Cotton Mill had a power requirement of about 2,200 kW which was supplied by a Brown-Boveri turbine of some considerable age and a nameplate rating of 5,000 kW. To steam this set, there were two Krupp boilers whose condition was such that, burning the rather inferior fuel which alone was available, one boiler was just capable of supplying the peak load of 2,200 kW. It was therefore rather rash to assume that there was any generating capacity surplus from this plant at all.



To make this power available to the Adamjee Mills, the Government installed a 5,000 kVA transformer at Dhakeswari and ran approximately two miles of 0·30 sq in. 11 kV cable from the transformer to the jute mills. This cable, for the greatest part of its length, ran on a route which was subject to annual flooding, and it had to be laid and jointed before the water rose to its flood level in July. A certain amount of the cable was in fact laid before there was any appreciable flooding but the last four or five lengths on the jute mill site were laid on ground which was already flooded to a depth of three feet or so. The ground over which the route ran for these lengths was so bad that the writer had advised the Government engineers that it would be impracticable to bring cable drums to the necessary positions for drawing in the cable and he therefore advised that a method which had previously been successfully used in India might be employed.

Wet Weather Cable Laying

This method involves the provision of one man to every yard of cable. On a given signal they all grip the cable and lift it bodily onto the top of their heads, on a second signal they walk ahead and on a third signal they halt. There is no necessity to have a signal for dropping the cable to the ground again—this happens only too easily. However with a lot of good humour, a great deal of patience and the ability to use some adequate bad language, the cable moves on at a surprising rate and it can be moved over very rough country more quickly and cheaply than by any other method. This advice was accepted by the Government during the dry weather, and it seemed to the writer that when the water was up to the shoulders of the smaller coolies it might prove impracticable. However the Pakistani engineer in charge decided to attempt to lay the cable under these circumstances and what is more, he succeeded in putting in some four or five lengths of 220 yards by this method under water up to probably 3½ ft



Above is seen a completed foundation block for a 600 kW diesel alternator, while the view of the 1,500 h.p. diesel on the right clearly shows the lifting gantry mentioned in the text

Tank No. 2 completed to maximum depth of 40 ft. and commencing to fill with water to provide a cooling pond

deep. "Machans," that is platforms of bamboo, were built above water level in order to make the joints and when these were made and tested they were lowered overside into the water.

Transformer Troubles

This cable was completely jointed and tested ready for service by about September but delay had occurred in the manufacture of the transformers and none of these had arrived on site or had indeed been shipped by that time. It was however found possible to obtain a 1,000 kVA transformer of the correct ratio from another project in Western Pakistan. This transformer was shipped from Karachi to Chittagong, but it had not been possible to obtain much information about connections except that it was known that the h.v. terminals were arranged for cable connection. It was therefore necessary to wait until the transformer arrived before any arrangements could be made for the secondary connections. It arrived on the river in the hold of a barge on the 13th December and, as it weighed in the neighbourhood of eight tons, and the heaviest crane on site could deal only with loads up to 5 tons, shear legs and chain blocks had to be rigged to lift it approximately 12 feet onto dry land because at this time the river was at its lowest level. It was safely landed that day and the next day was a Moslem holiday on which it was not possible to do any appreciable amount of work. During the following two days it was dragged by hand about 750 yards including a rise of about 7 feet on a route which had to be made as the work progressed. On the night of the 16th it was safely placed in its cell and on the 17th the work of preparing it for service commenced in earnest. It was found immediately on arrival on site that it was provided with a cable box for 7—0·75 sq in. single core cables, and this size of cable did not, of course, exist in the country. However, three core 0·25 sq in. did exist on the mill site and this could clearly be used. A sufficient length of this cable was therefore stripped of its armouring and, as soon as the transformer was in place, the work of jointing this cable into the secondary cable box was commenced.

The connection of the switchgear end of the cables was, however, a much more difficult proposition. As has already been mentioned it had been intended to connect the transformers by means of copper flats to the switchgear, and the switch terminals were therefore in the form of flat copper strips. It was therefore necessary to provide some form of terminal box for sealing the cable and then some sort of connection out of the cable box onto the switch tails. The first of these difficulties was easily enough solved and a sheet steel sealing box was fabricated and provided with seven brass wiping glands which were robbed from fuse distribution boards. A more serious difficulty was the complete absence of any suitable cable lugs or copper strip for connecting to the switch tails. The only copper strip which could be obtained was 1 in. x $\frac{1}{8}$ in., and it was considered that the smallest section that could be safely used would be 1·25 sq in., that is six of these strips per phase. The space available for making these connections was extremely limited, the phase centres on the switch being $4\frac{1}{2}$ in., and the total space available for the sealing box between the switch frames being about 22 in. x 6 in. The result was that the copper work had to be drawn out to full size on the drawing board and steel templates made of each piece, before bending could commence. It is also perhaps worthy of note that the drawing work for this project was done by the author.

The construction of this awkward sealing box progressed however and it was ready for jointing by the afternoon of the 19th. Jointing was complete on the evening of the 20th. The transformer had been supplied partly filled with oil and sealed in the factory and the seal had remained intact so that the windings of the transformer had remained in a good state of insulation and the oil gave a satisfactory test. It was therefore necessary to dry out only the extra oil supplied for topping up. A Stream-Line filter had been provided for this work, and, although it took almost the whole capacity of one of the generators to run this oil conditioning plant, the oil was brought to serviceability level in good time and power was switched on to the transformer early on the morning of the 21st December, eight days after the arrival of the transformer on site. The necessary initial tests of the machines had been carried out on the temporary power plant and so the initial start went off without a hitch on the auspicious day chosen.

Power Supplies

With production plant capable of running, there was an immediate demand for a substantial amount of power, and it was apparent that Dhakeswari Cotton Mill would not be able to supply more than a fraction of what would soon be required. The progress of the Siddhirganj project, adjacent to the Mills was disappointing. After more than a year, no work had been done on site and progress was confined to the calling of tenders for the civil engineering work. In the meantime, the first generators—870 kW Deutz Siemens diesel driven sets—were nearing completion and it was expected that the first of these would reach the site about May. The Monsoon would commence in June, that was the one certain date amid a welter of speculation and uncertainty, and if a Power House had not been raised above flood level by that time, no work could be done until the water receded in November.

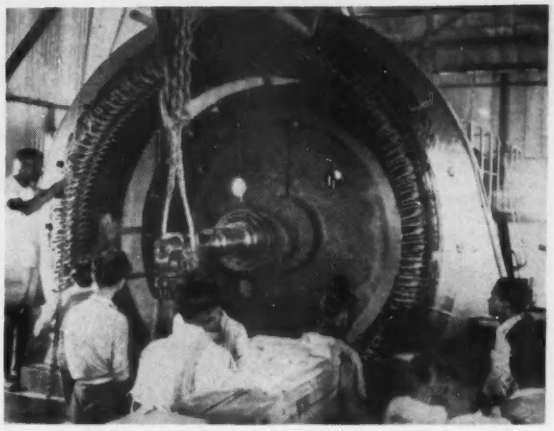
The writer therefore suggested that the Government should be urged to hand over the Deutz sets to Adamjees, and a substantial power house would be constructed on the Mill Site. Adamjee's directors were in agreement with this policy and a meeting was held with the Government to consider what steps could be taken to provide the necessary generating capacity as rapidly as possible. At this meeting a new progress schedule was put forward by the Government showing commissioning of the first set at Siddhirganj by October of that year, 1952. In spite of this, and largely due to the efforts of Mr. Ghullum Farouque, the chairman

of the Pakistan Industrial Development Corporation, the Government reluctantly agreed to hand over the first three Deutz sets to Adamjees for erection on the Mill site, and take a further decision concerning the second three after the lapse of three or four months had indicated whether the Siddhirganj project had any likelihood of living up to the new progress schedule.

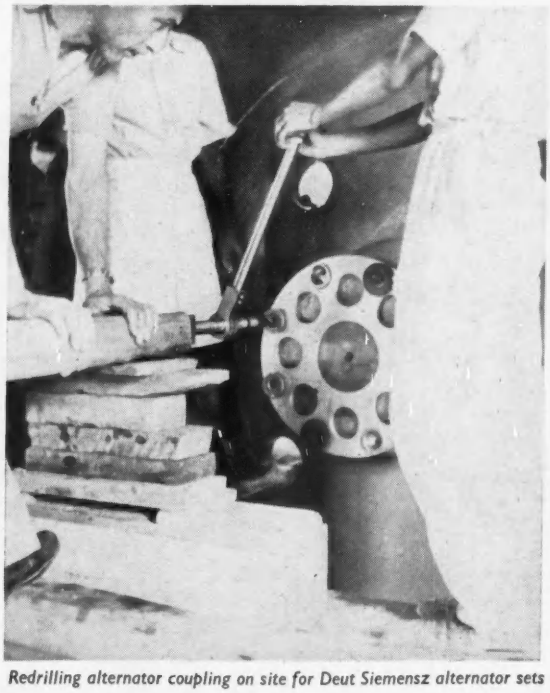
Building a Power House

A design for a power house was put in hand right away and a site selected. In the selection of a site at the Mill, a very fortunate circumstance operated in favour of the project, in that there was a cooling pond of very substantial capacity ready made. In order to raise the site of the Mills above flood level, a very large quantity of earth had to be provided, and this earth was obtained, according to local custom, by digging a hole. It was a large hole however, and the three "holes" which were planned to provide sufficient soil to raise the site, and which are known locally as "tanks," covered an area of 1,120,000 sq ft, and were an average of about 30 ft deep. One of these formed an ideal cooling pond for the engine sets and so the site of the power house was planned to be near the tank dug for the first mill, and this tank had been filled with water in the monsoon of 1951 so that it was ready for service.

The greatest problem in the design of the power house arose from the very low bearing capacity of the soil. The existing ground was about 8 feet below plinth level of the power house if the floor was raised 1 ft above the highest known flood level, and the soil of the existing ground was what is known as "black cotton." This is superposed above a clay subsoil which is mostly easily permeable by water and in which water migrates easily under pressure with consequent shrinkage. The shrinkage on drying of this clay was estimated to be about 10%. There was however a layer of approximately three feet thickness of impermeable clay about four feet below existing surface and this layer had negligible shrinkage on drying. This layer was then chosen for the foundations for the power house and it was arranged that the foundations should extend down to this layer but remove as little as possible of it. The result was that all foundations became 13 ft deep. A foundation of mass concrete weighs about a ton for every 15 cubic feet so that a one foot square pillar will impose a load of 0·87 tons on its base if it is 13 ft tall. It was estimated that the maximum load that it was safe to impose on the foundations was 0·5 tons per sq ft and so a very considerable amount of extension was necessary to support the weight of the foundation alone. The engine makers had given a figure for the minimum desirable volume of concrete foundation to provide adequate inertia, and the foundation was therefore designed to have as little more volume than this as practicable, and the amount of material so determined was worked into such shape as would give the area of the base required by considerations of soil loading. The result of this was that a raft 20 ft wide was required for each engine and the individual engine blocks were separated from one another and the walls of the building by anti-vibration joints of bitumen.



Threading the rotor on 250 kVA Siemens alternator



Redrilling alternator coupling on site for Deut Siemensz alternator sets

The design of the building itself was rather difficult. No prior provision had been made for steel for this building, and the steel which was locally available was mostly of light sections. A crane for erection and maintenance was a requirement of first importance, and, as the building for three engines would be 66 ft by 70 ft, the possibility of making a travelling crane on site was rendered impossible by reason of the maximum load to be lifted, 17 tons, combined with the large span which called for beams of a very heavy section. In addition, the supporting arrangements for the crane rail looked like posing some insuperable problems. So the provision of a crane was reluctantly abandoned as impossible and lifting gantries were designed instead. These were made to lift 10 tons since this was the capacity of the heaviest chain blocks available, and the gantries were arranged so that two could be used simultaneously on the largest lift — the two portions of the cylinder block when bolted together. The best section available on site was a channel, 170 x 70 mm, and the gantries were built entirely of this section, together with 1/4-in. and 3/8-in. plate for plating the main beams and as battens for the columns.

The span of these gantries was 22 ft and they moved on four cast iron rollers which had inching bar holes drilled in their faces. Channels were laid parallel to the engine centre lines to serve as rails and these rails were grouted into the upper surfaces of walls which were built longitudinally between engine foundations and these walls were provided with extended foundations 13 ft below plinth level. The space above the raft, from the rail supporting

walls to the engine crank case, was left open and covered by a timber floor which was strong enough to land a cylinder head on it with complete safety. It may be remarked here that these gantries proved a great success in use and Deutz's erecting engineer stated that he preferred this method of lifting to the single overhead crane which might have been provided.

Engine Erection

With engines of this size it is highly desirable to use heat exchangers so that the temperature difference between the cooling water entering and leaving the engine should be as small as possible, so minimising thermal stresses on cylinder liners, etc. The Government had proposed to install multiple heat exchangers with these engines, one heat exchanger serving several engines, an arrangement which the writer does not favour, and these heat exchangers were not likely to be available in time. It was therefore decided to attempt to manufacture heat exchangers on site although the materials available were not promising. Bronze tube was not available at all. Enough bronze might have been found for tube plates, but only at the expense of other priority projects, and with the small cupola in the foundry anything like a large body casting was unlikely to be produced free from porosity. So the next thing was to look about for substitutes. Firstly tube: well tube was available in the form of $\frac{3}{4}$ in. conduit in sufficient quantities and either in aluminium or in solid drawn steel. If aluminium tubes were used the tubes plates should be of aluminium too and ingot aluminium was not available, and if the tube had been melted down for casting, alloying materials were missing, and casting of pure aluminium is not amusing. So aluminium tubes were out and steel tubes were in, and these could be used with cast iron tube plates and steel ferrules. Next was the problem of bodies, and here the most attractive material available was standard water pipes of some form or another. Tentative designs indicated that the most hopeful proposition would be pipes of 6 in. or 8 in. bore and 6 in. cast iron pipes could be stolen from the sprinkler installation. The design proceeded on this basis and some fairly large castings were produced to circulate the two water circuits through the four pipes which formed the exchanger. The design velocities were fairly high and the Government engineers, comparing the cooling surface provided with that of outside suppliers' quotations in their possession, were convinced that they would be hopelessly inadequate, but in fact they worked very well, and the 100% extra surface which had been provided to take care of fouling, appears to have been a good deal more than will ever be necessary.

Another major item which was missing was provision for terminating the stator cables to the alternators. The alternators generated at 11 kV and the manufacturers had provided bare copper strip terminals. It was never satisfactorily determined where the responsibility for the omission of the stator cable boxes lay, but the fact remained that they had to be improvised on site. The greatest difficulty in this connection was the complete non-availability of porcelain insulators, but recourse was again had to the laminated plastic sheet which has already been mentioned, and a cone type bushing was satisfactorily built up from this material, and was the basis of a perfectly satisfactory cable box and in this case one which was quite pleasing to the eye.

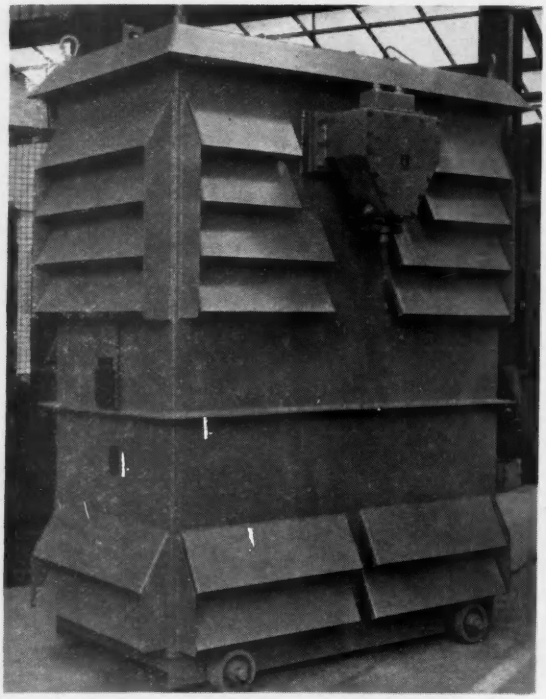
There were quite a lot of difficulties in the erection of these engines, and of course the usual crop of minor improvisations to replace minor items that were lost in transit or damaged, because the right material was never available, but the chief and most time consuming difficulty was a continuous shortage of gas for welding and pipe bending. A further difficulty arose from a certain lack of liaison between the engine and alternator makers, which had resulted in the couplings of the two being bored on different pitch circles, so that the alternator coupling had to be redrilled on site. The time taken to erect the three sets was from the completion of the first foundation on the 7th August, 1952, to the first run of the third engine on the 1st August, 1953.

(To be concluded. Part I commenced on page 195 of the issue of 11th February.)

300 kVA AIR-COOLED TRANSFORMERS

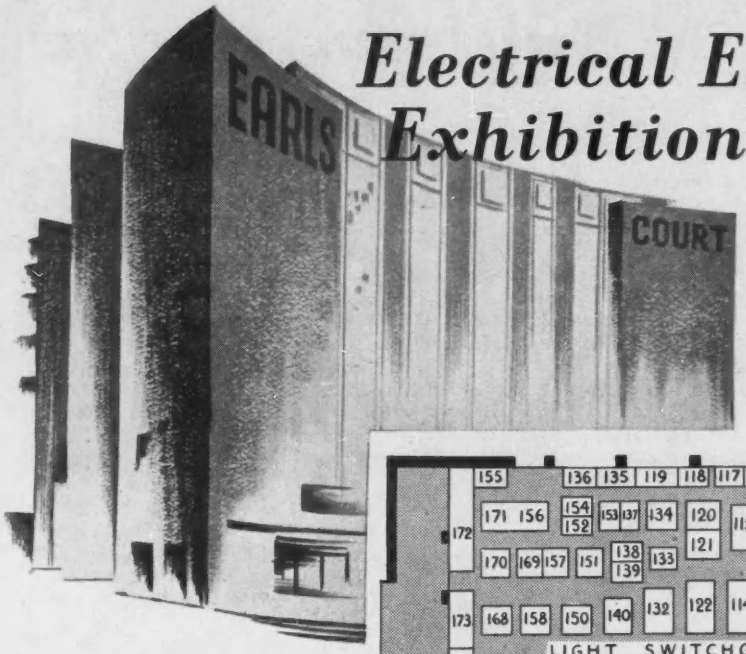
TRANSFORMERS (Watford) Ltd. who have pioneered a number of important developments on the design and manufacture of the dry-type, air-cooled transformer, have recently completed a number of 300 kVA, 11,000 volt, naturally air cooled equipments for outdoor operation and this is believed to be the first occasion on which units of this size have been made in this country for this duty. These units are cooled by natural circulation throughout and the louvres are of special weather-proof design to prevent the ingress of moisture in severe weather.

Core, clamps, winding risers and tapping assemblies have had to receive special attention to prevent deterioration should the transformer remain unenergised for lengthy periods in a variety of high humidity conditions. Special attention has also to be paid to the design and impregnation of the windings, which use fire-safe materials. On the mounting of the coils and the end insulation between clamps, special precautions have had to be taken to guard against flashovers in the event of the transformer being energised initially following humid atmospheric conditions and the use of porcelain has figured prominently in this type of construction. The transformers are fitted with cable boxes on both h.v. and l.v. sides and they are rated and tested in accordance with B.S.S. 171/1936.



Dry-type outdoor air-cooled, 300 kVA, 11 kV transformer in the works

Electrical Engineers Exhibition



EARLS COURT, LONDON

MARCH 16–20

(10 a.m.—7 p.m.)

ORGANISED BY
ELECTRICAL ENGINEERS
(A.S.E.E.) EXHIBITION LTD.

LIST OF FIRMS EXHIBITING

	Stand No.
A. & M. Electrical Services	144
Aerialite Ltd.	151
Agro Electrical Co., Ltd.	117
Aidas Electric Ltd.	63
Ashley Accessories Ltd.	112
Associated Technical Manufacturers Ltd.	175
Association of Electrical Machinery Trades	24
Association of Supervising Electrical Engineers	27
Astral Switchgear Ltd.	112
Austin Crompton Parkinson Ltd.	171
Automatic Coil Winder & Electrical Equipment Co., Ltd.	56
Backer Electric Co., Ltd.	62
Barlow Whitney Ltd.	111
G. Becker Ltd.	19
Benjamin Electric Ltd.	43
Berry's Electric Ltd.	138
Bill Switchgear Ltd.	69
F. C. Blackwell & Co., Ltd.	55
Thomas Bolton & Sons Ltd.	79
S. O. Bowker Ltd.	85
Britmac Electrical Co., Ltd.	30
British Electrical & Allied Industries Research Assoc.	26
British Electrical & Allied Manufacturers Assoc.	13
British Electrical Development Assoc.	25
British Electrical Repairs Ltd.	91
British Electricity Authority	28/94
British Insulated Callenders' Cables Ltd.	46
British Productivity Council	42
British Thomson-Houston Co., Ltd.	86
Brookhirst Switchgear Ltd.	59
Brook Motors Ltd.	148
Brownings Electric Co., Ltd.	134
Brush Electrical Engineering Co., Ltd.	100
Bryce Electric Construction Co., Ltd.	152
Cable Makers Assoc.	6
Cantie Switches Ltd.	49
R. M. Catterson-Smith Ltd.	126
Cayson Electrics Ltd.	21
Channel Conduits Ltd.	93
Chapman & Hall Ltd.	18
Chilton Electric Products Ltd.	50
Chloride Batteries Ltd.	127
Clang Ltd.	143
Clare Instruments Co.	177
E. K. Cole Ltd.	67
J. A. Crabtree & Co., Ltd.	168
Crompton Parkinson Ltd.	23
Crypto Ltd.	48
Crypton Equipment Ltd.	48
Davis Sheet Metal Engineering Co., Ltd.	41
Dawe Instruments Ltd.	19
Delco-Remy-Hyatt Division of General Motors Ltd.	101
G. P. Dennis Ltd.	53
Department of Atomic Energy	163/5
"Diamond H" Switches Ltd.	84
Dimplex Ltd.	82
Donovan Electrical Co., Ltd.	64
Dorman & Smith Ltd.	4
Dowty Equipment Ltd.	135
Edison Swan Electric Co., Ltd.	29
E. F. Electric Ltd.	57
Ekco-Ensign Electric Ltd.	73
Electric Construction Co., Ltd.	58
Electric Depot Ltd.	116
Electrical Apparatus Co., Ltd.	89
Electrical Assoc. for Women	14
Electrical Industries Benevolent Assoc.	16
"Electrical Journal" Benn Bros. Ltd.	5
"Electrical Review" Iliffe & Sons Ltd.	15
"Electrical Times" Ltd	12
A. Ellison Ltd.	68
G. Ellison Ltd.	87
E.M.S. Electrical Products Ltd.	109
Enfield Cables Ltd.	8
English Electric Co., Ltd.	37
Erskine, Heap & Co., Ltd.	122
Evershed & Vignoles Ltd.	66
Falk, Stadelmann & Co., Ltd.	120
Ferguson Pailin Ltd.	150
Ferranti Ltd.	90
Fitzgibbon & Murray Ltd.	176
Foster Transformers	48
Fractional H.P. Motors Ltd.	161
W. T. French & Son Ltd.	44
General Electric Co., Ltd.	113
Gillott Electro Appliances Ltd.	74
Gledhill-Brook Time Recorders Ltd.	2
G.M. Engineering (Ottery St. Mary) Ltd.	83
Gulf Oil (Great Britain) Ltd.	32
Hall Telephone Accessories Ltd.	11
Heatovent Electric Ltd.	61
Hedin Ltd.	20
W. T. Henley's Telegraph Works Co., Ltd.	38
Hirst Electronic Development Ltd.	36
Hivolt Ltd.	3
Holophane Ltd.	110
Hoover Ltd.	60
Hotpoint Electric Appliance Co., Ltd.	142
A. H. Hunt Ltd.	119
Igranic Electric Co., Ltd.	131
Isopad Ltd.	118
I.T.D. Ltd.	171
Jeary Electrical Co., Ltd.	81
Johnson & Phillips Ltd.	132
Keith Prowse & Co., Ltd.	1
Kerson Manufacturing Co., Ltd.	97
J. Kilpatrick & Son Ltd.	104
Lancashire Dynamo & Crypto Ltd.	48
Lancashire Dynamo Electronic Products Ltd.	48
Lancashire Dynamo Switchgear Ltd.	48
Lansing Bagnal Ltd.	156
Lewden Metal Products Ltd.	153

continued at foot of page 358

Equipment and

Above, top, is an Erskine Heap 50 MVA, 3·3 kV ring main unit fitted with a wing isolator. Below it, the "Isodrum" drum heater which is thermostatically controlled. Left shows the new M.E.M. "Autoline" starter for machine tools

TO be opened next Tuesday by Sir Henry Self, Deputy Chairman B.E.A. and President of E.D.A., the Third Electrical Engineers Exhibition promises to be even more successful than last year's show. Concerns, who, in common with the ELECTRICAL TIMES, have consistently supported this all-electrical event since its inception, see in its expanding size that their confidence was not misplaced. A greater number of visitors from overseas, due to be present this year, provide further indication of the exhibition's importance. In 178 stands, almost double the number of electrical organisations are represented this year, covering a floor area of some 150,000 sq ft. Confronting the electrical engineer is a representative variety of well known equipment, together with a substantial proportion of new items, which range from high voltage switchgear to heating appliances. Switchgear forms the underlying theme, equipment for all purposes being displayed in two special avenues. For our readers' guidance we give below brief details of the exhibits. The exhibition is open each day from 10 a.m. until 7 p.m., closing on Saturday, March 20th. Admission is by ticket or by presentation of a trade card.

A. and M. Electrical Services

Armature and stator windings, specialising in repairs, re-winds and conversions of motors and generators from fractional up to 50 h.p. in size, this company displays aspects of electrical repair work. No. 144.

Aerialite Ltd.

Of special interest at this stand are the "Ashathene" wiring systems displayed, showing the standard thermoplastic cable in use for lighting circuits and the armoured version supplying power circuits. Special sealing glands for installations where corrosive atmospheres and moisture predominate are also on show. Another product which may be inspected is the retractable cord used for instrument leads. No. 151.

Agro Electrical

Being introduced at the exhibition is a range of weatherproof, ironclad bells and switches, which can be seen together with a display of domestic bells, buzzers and associated equipment and wiring accessories. The new range are in stove enamelled grey malleable iron casing with two cable entries. Coil is wound on a bakelite bobbin laminated steel core, with heavy duty silver contacts. No. 117.

Aidas Electric

Chief feature of the "Sadia" stand is seen in the new "Select" water heater. Of three-gallon capacity, this unit is rectangular in shape and modern in appearance. Its hot tinned copper tank, pressure tested at 20 lb/sq in., has an embedded element of 1,000 watts standard rated and thermostatically controlled. Apart from a representative range of immersion heaters, the company is also showing its types UDB and CEL storage heaters. No. 63.

Ashley Accessories

Exhibiting with two associated companies, Ashley show examples from their range of accessories for lighting and power installations. In their tumbler switches is featured the "Duo-Base" unit, a two-gang, switchbase for p.d. or B.S. 1299 boxes. No. 112.

Associated Technical Manufacturers

A new product for the installation engineer takes the form of "Permathene" cables, using as core insulant a stronger grade of polythene and a p.v.c. sheath based on "Diolpate." A new polymeric plasticiser developed by the company, this material is stated to confer full flexibility over a wide temperature range. No. 175.

LIST OF EXHIBITORS—*Continued*

	Stand No.
Liverpool Electric Cable Co., Ltd.	137
Loma Electronic Equipment Ltd.	136
Londex Ltd.	102
London Electrical Co. (Blackfriars) Ltd.	115
London Electric Wire Co. & Smiths Ltd.	137
Longlamps Ltd.	105
Arthur Lyon & Co. (Engineers) Ltd.	154
R. Maclaren Co., Ltd.	157
Major Equipment Co., Ltd.	162
Mantel Metalworkers Ltd.	9
Marryat & Place Ltd.	78
Martindale Electric Co., Ltd.	178
William McGeoch & Co., Ltd.	52
Measuring Instruments (Pullin) Ltd.	160
Mersey Cable Works Ltd.	108
Methuen & Co., Ltd.	18
Metropolitan-Vickers Electrical Co., Ltd.	31
Metway Electric Industries Ltd.	172
Midland Electric Manufacturing Co., Ltd.	98
Millett Levens Ltd.	169
M. K. Electric Ltd.	70
M.T.E. Control Gear Ltd.	123
Nelson Engineering Co., Ltd.	95
Nettle Accessories Ltd.	151
Nevelin Electric Co., Ltd.	48
New Day Electrical Accessories Ltd.	74
Oliver Pell Control Ltd.	128
Partridge Transformers Ltd.	77
Partridge Wilson & Co., Ltd.	139
Philips Electrical Ltd.	33
Porter Electrical Products Ltd.	155
Power Centre Co., Ltd.	114
Pyrotenax Ltd.	103
Quickdraw Co.	40
Radio Heaters Ltd.	173
Ranton & Co., Ltd.	146
Rawlplug Co., Ltd.	124
Record Electrical Co., Ltd.	45
Revo Electric Co., Ltd.	158
Reyrolle & Co., Ltd.	7
Rheostatic Co., Ltd.	140
Rolls Switches Ltd.	130
Wm. Sanders & Co. (Wednesbury) Ltd.	80
Santon Ltd.	65
G. H. Scholes & Co., Ltd.	129
Scottish Cables Ltd.	75
Service Electric Co., Ltd.	96
Siemens Electric Lamps & Supplies Ltd.	141
Simplex Electric Co., Ltd.	35
Frederick Smith & Co.	137
Standard Telephones & Cables Ltd.	47
J. G. Statter & Co., Ltd.	159
Sun Electrical Co., Ltd.	88
Sunvic Controls Ltd.	34
Switch & Control Co.	145
Synchronome Co., Ltd.	92
Telegraph Condenser Co., Ltd.	174
Telegraph Construction & Maintenance Co., Ltd.	17
Thermodare (Great Britain)	54
Thorn Electrical Industries Ltd.	149
F. W. Thorpe Ltd.	170
T. M. C. Harwell (Sales) Ltd.	71
Trevelyans (Birmingham) Ltd.	107
Troughton & Young Ltd.	125
J. H. Tucker & Co., Ltd.	97
Tudor Accumulator Co., Ltd.	51
Tufnol Ltd.	68
Uni Tubes Ltd.	106
Vactite Wire Co., Ltd.	137
Varilectric Ltd.	167
V. G. Porcelain Co., Ltd.	112
W. G. Walker & Co. (Engineers) Ltd.	72
Walsall Conduits Ltd.	10
Wandsworth Electrical Mfg. Co., Ltd.	22
Watford Electric & Manufacturing Co., Ltd.	99
Westinghouse Brake & Signal Co., Ltd.	121
Westwood Switchgear Ltd.	147
Henry Wiggin Co., Ltd.	76
Woden Transformer Co., Ltd.	133
Woods of Colchester Ltd.	39

Appliances on View

Astral Switchgear

One of the "Ashley" group, this company display their distribution equipment, which includes busbar chambers, link boxes for l.t. power and telephone cables and types of fabricated steel housings. Featured on the stand is the new multi-way terminal link block. No. 112.

Austin Crompton Parkinson

Two types of electric vehicle are to be seen here, of which one is a 20 cwt Morrison "Electricar" chassis of new design which should have a wide appeal. Having wider and stronger axles, the new chassis incorporates "Silentbloc" bushes in the springing, has increased driver vision and turns in a circle of 31 ft radius—8 ft less than previous models. No. 171.

Aut. Coil Winder El. Equip. Co.

The visitor to this stand will find all the "AVO" range of instruments on show. Models 7 and 40 of particular value to the power engineer. Associated with the former is the p.f. and wattage unit, thus providing the maintenance man with a portable instrument of considerable versatility. Engineers on the stand will also be available to discuss problems of coil winding. No. 56.

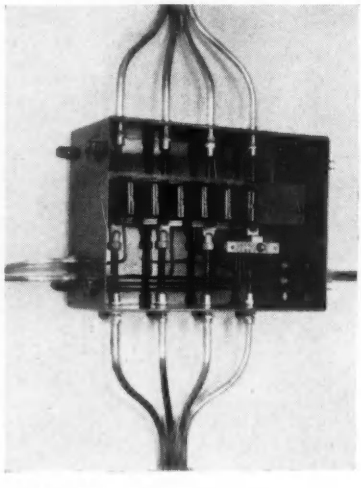
Backer Electric Co.

At their first showing at the A.S.E.E. exhibition, Backer feature their tubular sheathed element, displaying its uses for industrial heating. Elements for infra-red drying, cartridge heaters for platen and dieheating, assemblies for casting in aluminium and steel and many other exhibits illustrate the wide range of sheath materials available. No. 62.

Barlow-Whitney Ltd.

Process heating plant for a number of diverse applications forms the attraction of this stand, chief of which is a single autoclave unit for high vacuum and pressure impregnating. For drying, stoving and curing are displayed three types of industrial oven. No. 111.

This photo suggests an application for Pyrotenax m.i.c.s. cables in rising main work



Geo. Becker Ltd.

For the domestic installation engineer, this stand has much to offer in the wide range of accessories displayed. New items on show include a range of a.c./d.c. switches, a 13 amp socket-outlet for surface installations and 15 amp flush and surface switched socket-outlets. No. 19.

Benjamin Electric

Being introduced to the market at the exhibition are a range of new lighting fittings including a convector type "Mobilux" reflector and a new bezel ring for flush ceiling mounting which accommodate standard reflectors. For the industrial lighting engineer, Benjamin show a new dispersive reflector for 1 kW e.d. lamp designed for mounting at medium height. No. 43.

Berry's Electric

Also introducing new products to the market is this company, the feature here being two new sink type storage water heaters. Three sizes—1, 1·5 and 2 kW—of the "Raydair" heater are also being shown, emphasis being given to industrial and commercial applications, whilst a full range of immersion heaters can be inspected. No. 138.

B.I.C.C.

Of the many types of cable on show here, mass-impregnated non-draining, oil filled, and impregnated pressure types will appeal to the power installation engineer. For lighter circuits there are rubber and p.v.c. insulated cables, and a range of v.r.i. aluminium sheathed cables demonstrates the popularity of this type. No. 46.

Bill Switchgear

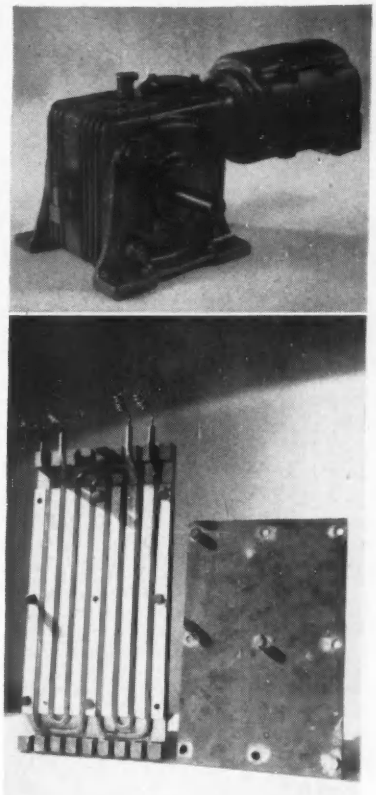
Adjoining Switchgear Avenue, this company's stand is devoted to low tension distribution and switchgear foremost among which is their "Crown" range now extended to include a 60 amp capacity unit. Another new item is seen in the "Imperial" range of h.r.c. fused switches available with a mechanical on-off indicator. No. 69.

F. C. Blackwell and Co.

Of the new lines displayed on this stand, plaster depth switch-boxes and back to back switch-boxes for partition walls form a centre of interest for the installation engineer. Other conduit accessories include extension pattern boxes to facilitate changing from sunk to surface installation of conduit and a comprehensive range of lug grip adaptors. No. 55.

Thos. Bolton and Son

Products in copper and copper-base alloys form an attractive display for the engineer, who can inspect "Combarloy" h.c. copper and chromium-copper commutator segments, busbars and end-rings in a range of sizes. No. 79.



The top illustration shows a geared unit by F.H.P. Motors, and below a 3 kW Backer element set for a groove hotplate

S. O. Bowker

The scope of the "Tenby Pilot Frigate" range of flush switches on show is increased by the recently introduced plaster depth pressed steel boxes which provide for automatic levelling of the switch relative to the plaster wall surface. No. 85.

British Electrical Repairs

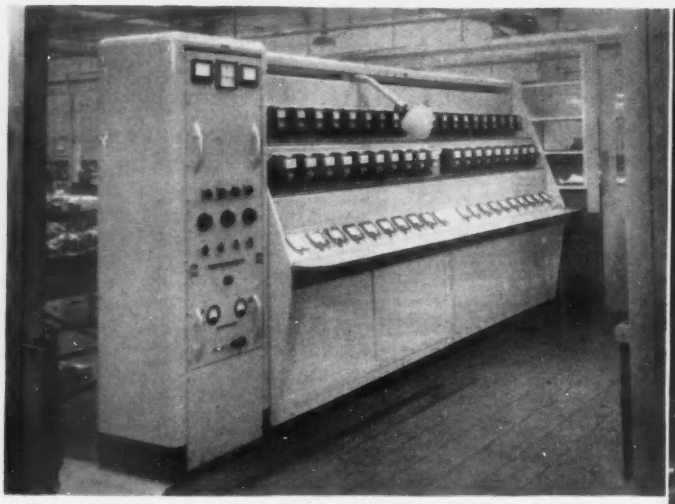
Indicating the service given by this company, the exhibit displays representative types of coil for both high and low tension work. Coil winding is also represented by a coil winding and forming machine together with a field coil winding machine both in operation. No. 91.

Britmac Electrical

One of the largest ranges of 13 amp size accessories is further augmented by several new items being introduced to the market at this exhibition. Also on view is the new cylinder lock range of switches, stated to be absolutely tamper-proof, which are available in flush, industrial and domestic types. No. 30.

Brookhirst Switchgear

Control boards of standardised design form a prominent part of this exhibit, of particular interest being the "Minorbord," a flat back type designed to control a group of small motors. No. 59.



Ferranti are featuring this new model high speed testing equipment for s.p.,a.c., meters. The operator on the right is using the improved version of the model 51 vacuum cleaner which is exhibited by Service Electric

Brook Motors

Readers of "Equipment for Industry" will recall the recent B.S. 42 fractional h.p. motors for use on small motors which form one of the new products on a stand devoted to the lighter range of Brook motors. Also displayed are motors designed to the B.S. Draft Specification CR(ELE) 4464 in drip proof and totally enclosed patterns together with examples of control gear. No. 148.

Brownings Electric

Among items we understand this firm is showing are to be seen rotary junction boxes—a new product this year. Of their standard lines, commutators and slip-rings, soldering irons and examples of stator, armature and other types of winding are displayed. No. 134.

Brush Electrical Engineering Co.

On this company's stand are to be seen examples of Brush switch and fuse gear which includes their type "OR 38," an outdoor pattern rated at 1,000 amp at 33 kV, rupturing capacity 750 MVA. Fitted with the pneumo-hydraulic closing system, four or five closing operations may be performed without recourse to external electrical supplies. No. 100.

Bryce Electric Construction Co.

For the maintenance or works engineer is a new power factor tester comprising a capacitor connected in series with a tapped coil placed over the jaws of a standard clip-on ammeter, thus able to measure over a wide current range without breaking into the circuit. No. 152.

B.T.H.

Of all exhibits being shown, that of the B.T.H. 220 kV o.c.b. in Switchgear Avenue probably creates most interest. Although only an end-phase unit is being displayed, for obvious reasons of space, the breaker demonstrates the novel lenticular shape of the oil chamber. Known as the "Shuntarc," the complete breaker has a rupturing capacity of 5,000 MVA and its total short-circuit break time is stated to not exceed three cycles. Also in the switchgear display are two examples of B.T.H. metal-clad, vertical-plugging drawout switchgear for power station auxiliaries or industrial use. No. 86.

Cantie Switches

Centrepiece of this stand is a display of the new "Minunit" cubicle switchboards, developed to provide a compact, unit built, flush fronted equipment capable of rapid extension or modification. Switchgear for use on these boards are of identical dimensions up to 60 amp in size, whilst for higher ratings the heavy duty range are used, these incorporating the "bolt lock" mechanism. No. 49.

R. M. Catterson Smith

Although exhibits on this stand are confined to furnaces for laboratory use, together with examples of refractories made for their products, this company are noted for the range of furnaces for pottery in schools, studios and industry and for glass work and heat treatment of metals. Much of their equipment is produced to individual requirements. No. 126.

Cayson Electrics

Representative examples of all this company's products can be seen, notable among which are transformers for low voltage lighting, mains conversion, soil heating, battery charging and other comparatively low power uses. No. 21.

Channel Conduits

Here the installation engineer and wireman may inspect the bread and butter of his work in the range of cable trunking known as "Channel (spring capped) conduit," an overhead busbar system and surface cable ducting displayed. No. 93.

Chilton Electric Products

On display for the first time are demonstration models of this company's core balance earth leakage c.b. and combined core balance and voltage operated earth leakage c.b., whilst "Atlas" miniature h.r.c. air-break c.b.'s and other products are shown. No. 50.

Chloride Batteries

Maintenance and design engineers associated with electric vehicles will find much of interest in a group of "Exide-Ironclad" cells for this purpose. Emphasis is given to battery operated emergency lighting, "Keepalite" systems being represented by a standard charging/control cubicle for a 50 V circuit of the non-maintained type. No. 127.

Clang Ltd.

On this display of accessories, we understand that special attention is being drawn to the company's range of surface, semi-recessed and flush switches. No. 143.

Clare Instrument Co.

For industrial use, the range of electrical and electronic instruments shown here include m.c. ammeters and voltmeters of rationalised design, having sprung jewels and $\frac{7}{8}$ in. tunnel diameter fitted into round and square cases from 2 in. to 5 in. sizes. No. 177.

E. K. Cole Ltd.

Here the engineer particularly concerned with electric space heating can see the wire range of "Ekco Thermovent" heating equipment. This includes the "FR" series of floor standing, convection heaters with an improved duct system, available in 1 kW and 2 kW sizes, and the "SR" series of 1, 2 and 3 kW ratings, intended for commercial and industrial use. No. 67.

J. A. Crabtree

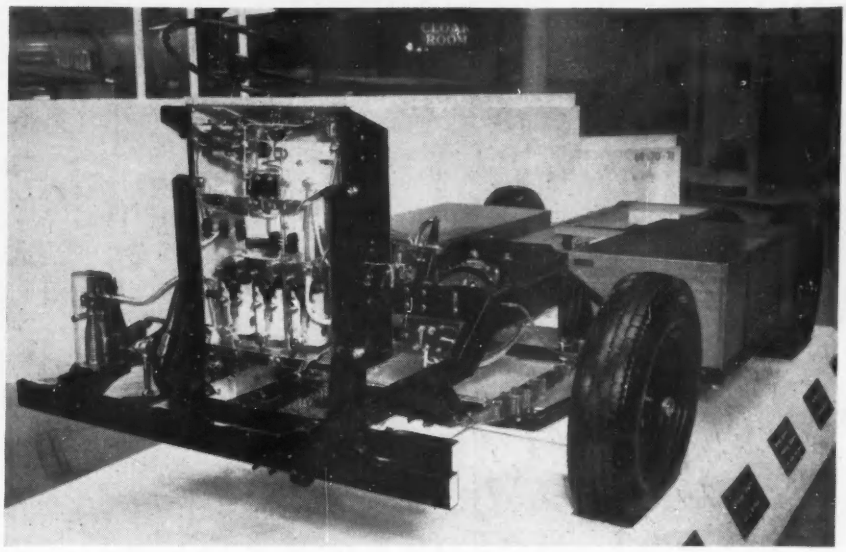
For the motor designer, the new D-6 hand-operated starter for motors up to $\frac{1}{2}$ h.p. in size makes a particularly interesting item whilst another new product is seen in a range of a.c. flush switches, available in single or twin units. Prominently displayed is a range of B-15 air break contactor type starters. No. 168.

Crompton Parkinson

Examples taken from the range of "Klosd" squirrel-cage induction motors conforming to the new British Standard form a centre of attraction whilst the instrument engineer will find much of value in the 7 in. and 10 in. circular scale instruments on show. No. 23.

Crypto Ltd.

The contribution from this member of the Lancashire Dynamo group comprises a hand and face drier for general use in factories, pithead baths and allied premises. No. 48.



Austin Crompton Parkinson have this new design 20 cwt Morrison Electricar Chassis

Crypton Equipment

Here the maintenance engineer can inspect a vehicle battery charger capable of charging 20 lead acid cells at 20/10 amp from a single-phase input at 200/250 V. For instructional use in schools is seen a combined a.c./d.c., l.v. power supply equipment. No. 48.

Davis Sheet Metal Engineering Co.

Standard type cable trunking with "Quick-Fix" covers and all accessories illustrates this company's products for installation work. Special sections of the flush mounting, skirting and compartment types indicate the comprehensive nature of this product. No. 41.

Dawe Instruments

Exhibiting in conjunction with Geo. Becker Ltd., this company are displaying much to interest the maintenance engineer. A particular item in this respect is their "Stroboflash" type 1200/1, which covering a range from 250 to 18,000 r.p.m. is of considerable value in observing shafting or machines in motion. No. 19.

Delco-Remy-Hyatt

This stand is given over to "Delco" motors produced in this country. A number of the exhibits being shown in cut-away form. Most are in the low power range for single-phase supplies, being suitable for use in electrical appliances. No. 101.

G. P. Dennis

Here the installation design engineer may view this company's range of heavy duty h.r.c. fused switches up to 800 amp capacity. They are shown complete with various accessories to demonstrate the adaptability of the gear. No. 53.

"Diamond H" Switches

Electric cooking appliance designers can see on this stand the new series of heater switches and thermostats. Built on porcelain bases, the switch units are fitted with new style push-on fixing, self-indicating handle dials. No. 84.

Dimplex Ltd.

Now comprising eight models, Dimplex permanently oil-filled electric radiators provide means of space heating where panel type units are required. Loading range from ½ to 2 kW, whilst two models of column type radiators are available, rate at 1½ and 2 kW. In hazardous areas, the flameproof and gas tight unit also shown may be employed, being free of purchase tax when bought for this purpose. No. 82.

Donovan Electrical

Changeover and trolley wire safety switches are included in the range of Donovan industrial switch and fuse gear being displayed, whilst control gear is represented by many types of automatic motor starters, relays, contactors and accessories. Illustrating activities in industrial distribution is the "Runtact" enclosed duct system for feeding hoists, cranes or portable tools. No. 64.

Dorman and Smith

Latest addition to Dorman and Smith switchgear, the "TS" range can be inspected together with unit and cubicle type switchboard in which this unit is incorporated. Miniature circuit-breakers, lighting fittings and a new range of disboards are displayed. An associate company, D. S. Plugs Ltd., feature domestic plugs and socket-outlets in both round and rectangular pin types, whilst British Klockner Switchgear exhibit "Linnett" rotary and reversing switches and motor control equipment. No. 4.

Dowty Equipment

Although widely used in aeronautical engineering, the "Dowmic" sequence switch, which is on show, has considerable potentialities in industrial applications. Having d.p. changeover contacts, the switch performs the dual function of indicating movement and initiating operation of ancillary equipment. No. 135.

Edison Swan Electric

On show for the first time is the "Utilux" range of fluorescent lighting equipment which provides a number of alternative reflectors used with single or double lamp channels. Also new to this exhibition is the "Blendolite" industrial blended lighting unit in which particular emphasis is given to heat dissipation. No. 29.

E. F. Electric

Wiring accessories being displayed here include the recently introduced range of 2, 5 and 15 amp three-pin a.c. switch socket of both surface and flush designs. These are of small design, so that the 2 amp size fits a B.S. 1299 box and the usual 5 amp steel box houses the 15 amp flush sockets. No. 57.

Ekco-Ensign

To pick out one of their range of over 100 fluorescent fittings, there is to be seen an industrial unit for two 80 w, 5 ft lamps having a slotted steel reflector and open ends. Over 30 new fittings are featured for fluorescent lighting. No. 73.

Electric Construction Co.

Typical items from the E.C.C. range of switch and control gear include their type "OD" h.t. o.c.b. of breaking capacity 250 MVA, 6·6/11 kV, current rating 300/600 amp. For industrial systems there is shown a horizontal draw-out type of 40 MVA breaking capacity at 3·3 kV and 25 MVA at 400 volts. No. 58.

Electric Depot Ltd.

Local lighting fittings for industrial use form an important part of this display, these units featuring a base which provides for both wall and bench mounting. One is designed for use at mains voltage, the other, lighter in weight, being for use with a l.v. transformer. No. 116.

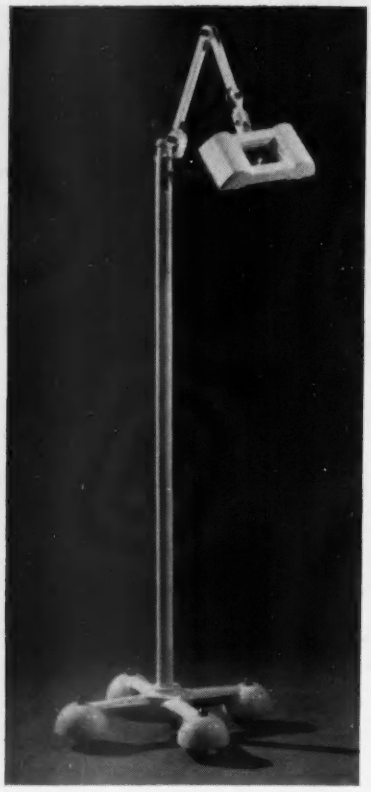
Electrical Apparatus Co.

Motor control gear in a variety of types is being featured on this stand, considerable space being given to d.c. air-break and oil immersed equipment. Contactor type a.c. units for all types of starters are also shown. No. 89.

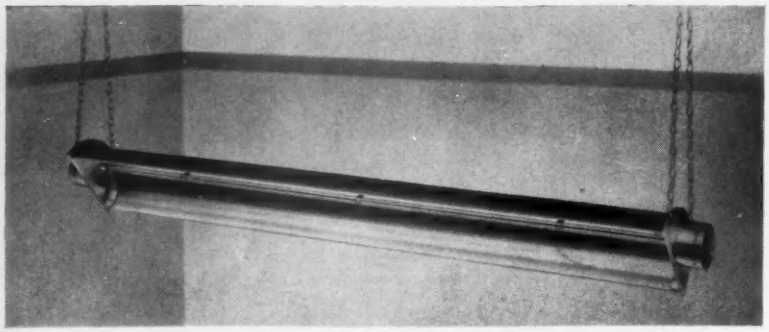
The Electrical Times extends a cordial welcome to all visitors. In addition to the several unique features of the Electrical Times, this year's stand (No. 12) will specially display the new section of the journal devoted wholly to Industrial Maintenance. Enlarged reproductions of specimen pages will be on view together with the actual equipment described in the articles.

Geo. Ellison Ltd.

Making its debut at this exhibition is an 11 kV circuit-breaker supported on a withdrawable truck and fitted with arc control devices. A.S.T.A. tested, and complying with B.S.116, the new breaker is of the vertical isolating type. Alongside the new breaker is to be seen a ring main isolator, whilst a 660 volt distribution switchboard will prove an attraction for many engineers. No. 87.



A Lens-aid fitting by Electro Depot Ltd. with right Heatovent's black heat radiant heater having chrome plated reflector



E.M.S. Electrical Products

Distribution systems shown on this stand feature the feed rail with collector shoe, this principle being used in both the "Trolley Duct" single-phase rail for supplying portable tools and appliances, and the "Uniduct" three-phase rail intended for use with h.f. supplies for tools and hoists. No. 109.

Enfield Cables

Here engineers will find another newly introduced product, this being the "ENsphere" lighting fitting specially designed for use with the Enfield grid suspension system. To reduce installation costs and time, the suspension connection box has been built into the fitting. No. 8.

English Electric

Serving the engineer are six departments of English Electric displaying a diversity of engineering equipment. From the switchgear department comes a type F 600 25 MVA, 400 volt switchboard incorporating their 1,600 amp O.B.3 and 600 amp O.B.2 air-break circuit-breakers. Applications of f.h.p. motor are seen in an industrial hand-drier which is shown in operation. Also working is a type 291 linear electrical actuator for operating boiler dampers. No. 37.

Erskine Heap

Again the installation and supply engineer benefits from new switchgear, which on this stand takes the form of a complete A.S.T.A. tested 11 kV, 150 MVA rupturing capacity, unit together with an 11 kV, 250 MVA c.b. fitted with the "Direct-blast" arc control device. No. 122.

Eversheds and Vignoles

Instruments for maintenance is the theme of Eversheds's stand, there being a range of the popular "Megger" insulation testers (including 10 and 2·5 kV units) and earth testers. Of the latter, three types are being shown, the series 2, low resistance, and series 4 units. No. 66.

Falk, Stadelmann

Of premier interest on Falk's stand is the range of lighting fittings, examples being taken to represent units for industrial, commercial and decorative purposes. In the middle class are the "Canopus" and "Sirius" units of contemporary design, whilst for industry is seen the "Louvrelite" all-plastic cold cathode unit together with a number of new fittings. No. 120.

Ferguson Pailin

Items this switchgear firm are showing include a 3·3 kV, 1,200 amp, 150 MVA type ASB.33 single busbar air-break unit, an advanced design of unit for power station auxiliaries and heavy industrial plant control. Visitors can also view an 11kV, 250 MVA outdoor pattern, oil immersed fused switch unit, type OFS, which combined with oil-break switches form typical main switchgear. No. 150.

Ferranti Ltd.

Products on this stand cover a wide range of activities. Representing the Transformer Department are seen a working model of a 50 kVA moving coil voltage regulator, a standard 50 kVA, t.p. 11 kV/443 V pole mounting transformer and scale models of large power transformers, among others. Instruments are also well represented. No. 90.

Foster Transformers

Showing examples of manufacture from each of their main product groups, Foster's display for the supply engineer ground mounting, rural and instrument transformers whilst special units indicate their capacity to meet individual requirements. No. 45.

Fitzgibbon and Murray

All types of electrical accessories are being shown, typical examples comprising torpedo switches, wall and desk table pushes, and bell pushes among others. Machined components in "Bakelite," "Ebonite," and other insulating materials are displayed. No. 176.

Fractional H.P. Motors

Comprehensive describes the range of small motors being shown here. There are series and shunt d.c. machines; single, two or three phase, shaded pole, capacitor and synchronous a.c. motors. Geared units, up to 1/3 h.p., range in torque from 2 to 800 lb in. and in speed from 1 to 600 r.p.m. No. 161.

W. T. French

Devoted entirely to "Mysto" electric appliances, on this stand can be seen a range of 10 in. and 12 in. electric fires, electric kettles and a recently introduced electric iron of modern design. No. 44.

G.E.C.

Here the engineer has a diversity of equipment to inspect, ranging from switchgear to fluorescent lamps. The "M.W." range of waterproof switch fuses and fused switches, the miniature a.c. link testing ammeter and link testing p.f. indicator are recent additions likely to appeal. For the maintenance man are weatherproof rotation switches for safeguarding conveyor systems. No. 113.

Gillott Electro Appliances

Demonstrating the flexibility and convenience of electric space and water heating, Gillott show their range of "Duo-Coil" immersion heaters and their 1 kW convector heater. No. 74.

Gledhill-Brook Time Recorders Ltd.

One of the first companies to produce efficient electric impulsed time recording machines, this firm display, in operation, a master transmitter driving models "C" and "JMC" metal cased recorders and a slave dial. No. 2.

G.M. Engineering

Foremost in the G.M. display are three industrial o.c.b. panels of the unit type, two of which are connected electrically and mechanically to form a composite switchboard. A cubicle switchboard of unit type, containing a 600 amp, t.p.n. air-break c.f.s. and outgoing circuits of twelve 60 amp t.p.n. fused switches is also on show. No. 83.

Gulf Oil

Petroleum media shown by this firm includes "Silvertown" transformer, switch and other insulating oils, inhibited turbine oils, meter lubricants, and cable impregnants among a comprehensive range. No. 32.

Hall Telephone Accessories

Precision instruments for development and design engineers form an attractive display, the exhibit including the G.K.N. micro-hardness tester shown fitted to standard bench type metallurgical microscopes. No. 11.

Heatovent Electric

Heating engineers should find considerable appeal in the equipment displayed here, which ranges from fan heater units to flameproof and dustproof heaters. For many types of space heating the "Tuvec" heater is a suitable unit, giving a high loading/lineal foot without a high surface temperature. No. 61.

Hedin Ltd.

Industrial heating equipment applicable to process heating displayed includes band, cartridge and strip heaters, asbestos woven resistance and heating nets and similar items. Electric ovens on show are of the convection and air circulating types, fitted with multi switching to give close temperature control. No. 20.

W. T. Henley

Among the cable exhibits are the latest types of fully-impregnated non-draining, and aluminium sheathed cables, whilst in the e.h.t. range are being shown 132 kV oil-filled and gas cushion cables and a model of a gas cushion cable sealing gland for this voltage. No. 38.

Hirst Electronic Development

Recent additions to the "HED" range of rectifiers feature prominently on this stand, these examples representing the selenium rectifying equipment built by Hirst to customers' requirements in sizes ranging up to three-phase units of 50 kW, with less than 0·1% ripple. Other equipment includes an air-conditioned bench for welding and assembly work. No. 36.

Hivolt Ltd.

Both research and production engineers will be interested in the 30 kV discharge detector and pressure tester which is designed for research and production testing. Measuring leakage resistance up to 30,000 megohms, the unit gives a life test of components. No. 3.

Holophane Ltd.

For the lighting engineer are shown a wide range of lighting units, among them being flameproof units for use in oil refiners and similar hazardous situations, and a reflector bowl-cast pendant embodying a watershed lip giving protection against dust and vapour entry. Commercial lighting is represented by "Inbilt Controlens" units giving a choice of light control according to the plate used. No. 10.

Hoover Ltd.

Fractional h.p. motors form the main subject of the Hoover stand, this company displaying its latest range of induction machine, incorporating advanced technique in die casting and motor design. Thermal overload protection may be supplied for such motors, this taking the place of the standard terminal board. Having wide possibilities for application, these motors range in speed from 950 to 2,850 r.p.m. at 50 c/s in all standard voltages. No. 60.

Hotpoint Electric Appliances

Home laundry equipment shown here includes washing machines, rotary ironer, table ironer and a clothes dryer apart from a special "Perspex" washing machine. Selections from the company's kitchen units are also on view, the equipment being displayed as planned kitchen. No. 142.

A. H. Hunt

Here are seen the possibilities of fixed capacitors in industrial applications, emphasis being given to p.f. improvement by the range of electrolytic, paper, metallised paper and mica types displayed. Units for use in fluorescent lighting fittings, on capacitor start motors and interference suppression illustrate the uses of modern capacitors. No. 119.

Igranic Electric

New products in the standard range of small starters and auxiliary switches being shown are push-button units and indicator lamps both of which are designed for panel mounting. No. 131.

Isopad Ltd.

This company exhibit a full display of industrial surface heating equipment based on their special process of using insulated heating elements, interwoven or fitted with high temperature glass cloth. No. 118.

I.T.D. Ltd.

Models of "Stacatruck" battery electric fork lift trucks on show at this stand combine ease of materials handling with accessibility of electrical components for maintenance. Lifting weights of up to 4,500 lb through a maximum distance of 14 ft, the trucks are constructed such that electrical components may be swung out on a hinged pannier for servicing. No. 171.

Jeary Electrical

One of the few wholesalers at this exhibition, this company features industrial electrical goods, devoting this year greater space to geared electric motors and flameproof equipment. No. 81.

Johnson and Phillips

Representing the J. and P. range of compound-filled switchgear of ratings up to 250 MVA at 11 kV is a type FG 16 o.c.b. unit. Of the vertical isolating pattern, this may be fitted with a plain break 150 MVA circuit-breaker or an arc control 250 MVA breaker. No. 132.

Kerson Manufacturing Co.

Exhibiting in association with its partner company J. H. Tucker, Kerson show a new range of moulded e.s. lampholders together with their "Uni-Quail" 5 amp switches and switched socket-outlets for use in B.S. 1299 boxes. Up to three gang switches may be accommodated in one section box. No. 97.

J. Kilpatrick and Son

Electrical installation contractors exhibiting collective information on a complete electrical service at home and abroad, this company's display comprises mainly photographs of electrical installation work together with examples of customers built switchboards. No. 104.

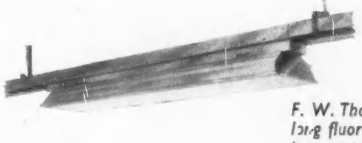
Lancashire Dynamo and Crypto

One of the seven companies exhibiting on this stand, L.D.C. show examples of their range of machines available for immediate delivery. Here also can be seen a partly wound stator of a two-speed, 390 h.p. "Corcooled" motor, one of ten machines to be supplied for Barking C power station. No. 48.

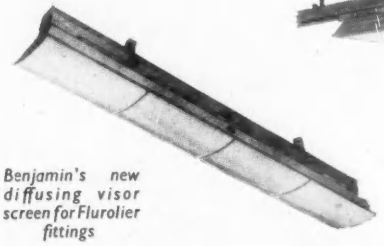
Lancashire Dynamo Switchgear

The switchgear activities of the L.D. group are represented by two medium voltage, 25 MVA boards, a "unit-to-unit" type heavy industrial board whilst there is also to be seen a new design unit cubicle flush type switchboard. No. 48.

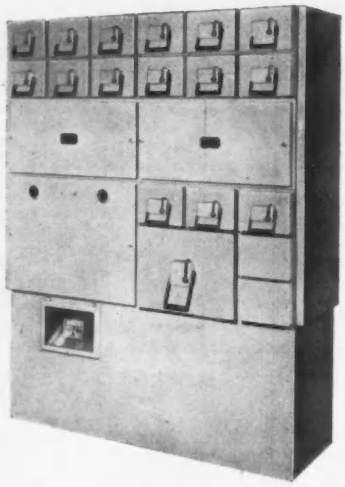
This is the "Wyvern," one of the new range of contemporary style fittings by Phillips Electrical



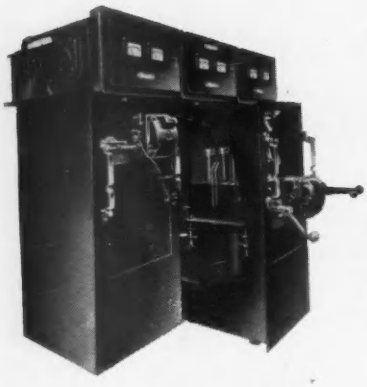
F. W. Thorpe's Slydalong fluorescent lighting system and an Ekco-Ensign Industrial reflector fitting



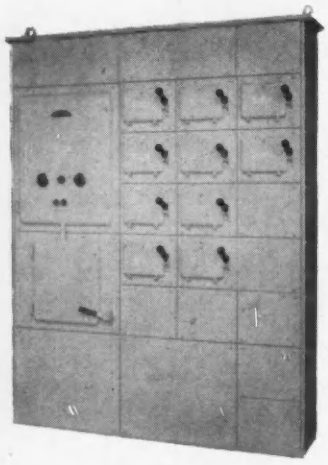
Benjamin's new diffusing visor screen for Flurolier fittings



This unit assembly type switchboard is built by Westwood Switchgear



Geo. Ellison's new 11 kV Switchboard (above) with one c.b. withdrawn to isolate it from the bars and truck withdrawn for maintenance



Cantie Switches also have a new form of flush mounted unit built switchgear

Lansing Bagnal Ltd.

From their wide range of materials handling vehicles, this company display four battery operated trucks. Included in the display is a new 3,000 lb pallet truck in which the drive unit of batteries and hydraulic gear are housed together in a compartment only 17½ in. deep. No. 156.

Lewden Metal Products

Engineers primarily concerned with supplies in damp locations will find an attraction in the watertight switchgear and diverse assortment of watertight plugs and sockets on display. There are, moreover, exhibits of accessories, covering conduit hooks, hook plates, bonding nipples. No. 153.

L. D. Electronic Products

New equipment shown by this Lancashire Dynamo company features an electronic adjustable speed drive in unitised form, permitting its use for varying applications by merely changing the type of sub-unit fitted. No. 48.

Loma Electronic Equipment

One of the few firms specialising in industrial metal detection, this company displays its "Metaltector" equipment which affords means for automatic detection of ferrous or non-ferrous metal in non-metallic materials. No. 136a.

Londex Ltd.

Control equipment in its varied forms makes an interesting display for the engineer. Emphasis as usual is given to relays, a working exhibit showing a score of standard models. New to this year's exhibition are a t.p. mercury switch contactor, busbar relay and an electronic relay. No. 102.

London Electrical Co.

Here the feature is the service offered by this company to industry, personified by display boards of equipment and materials which can be supplied for commercial and industrial application. No. 115.

London Electric Wire Co.

The "Lewcos" stand, which incorporates the associated companies Frederick Smith and Co., Liverpool Electric Cable Co. and Vactite Wire Company display a wide range of electrical conductors. No. 137.

Longlamps Ltd.

This display of lamps includes, we understand, a feature of ultra-violet forms of lighting which can be used to create spectacular effects. For the public lighting specialist, architectural lamps, neon lamps and others are on show. No. 105.

Arthur Lyon and Co.

For the engineer the attraction here lies in the "try it yourself" demonstration of the "Stamford" alternator. Showing how this self-excited machine maintains its 1·5% regulation at all loads and power factors, arrangements are made to operate it against a number of diverse load conditions. No. 154.

Robert Maclaren and Co.

Now in full production, the Maclaren water heater thermostat on show here will find application in many types of heater. Of the stem type, the operating portion is an invar rod within a brass tube. No. 157.

Major Equipment Co.

Typical "Major" neon and luminous fluorescent tubes for exterior and interior signs together with iridescent night lighting effects with u.v. lamps are, we understand, to be seen in a range of lamps and fittings. No. 162.

Mantel Metalworkers

For installation engineers concerned with supplies in modern flats, this company have an interesting exhibit in their rising main system, made up from stock components suitable for surface or concealed installations. The system employs a continuous steel duct serving not only to enclose the conductors but also to house fuses and neutral boxes for take-off. No. 9.

Marryat and Place

Engineering activities of this firm are represented by a display of their "Barduct" power distribution system together with a full range of tee and angle junctions and other accessories. A new feature is seen in the combined lighting and power system in which fluorescent lighting fittings are incorporated with the "Barduct." No. 78.

Martindale Electric

The maintenance specialist will find much to attract attention in the new range of mica undercutting machines which take the form of reciprocating tools and rotary milling cutters operated by either built in motors or flexible shaft drive. Rapid change-over of cutting heads facilitate speedy working. No. 178.

Wm. McGeoch and Co.

A new line being shown by this firm is a 5 amp, 15 pin plug and socket which can be seen together with a diversity of standard items. Among the latter are front and back-of-board switches (including high current slow-break units) and other examples of switch and fuse gear. No. 52.

Measuring Instruments (Pullin)

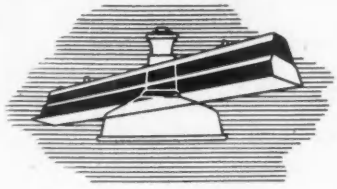
Much of a meter engineer's stock-in-trade can be seen in the range of precision, miniature, and portable indicating instruments and testing sets, which includes a series of illuminated dial pattern meters ranging from 1½ in. to 6 in. dial sizes. A newcomer is seen in a 7 in. scale quadrant meter with transparent dial and ruggedized m.c. movement. No. 160.

Mersey Cable Works

In their display of rubber, thermoplastic and varnished cambric insulated wires and cables, this company makes particular reference to types designed for use in mines, electricity generators, supply and distribution, gas works and shipbuilding. Available for use with thermoplastic cables of all types are glands and joint boxes also on view. No. 108.

Metropolitan-Vickers

Metrovick equipment on show for the engineer ranges from heavy switchgear to "Redring" boiling plates, particular items including a four-panel 11 kV switchboard



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to see their NEW LIGHTING FITTINGS

Better Lighting by **BENJAMIN** REGD.

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Smee's 6/54

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ELECTRIC STORAGE HEATER

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2 kW. Model:
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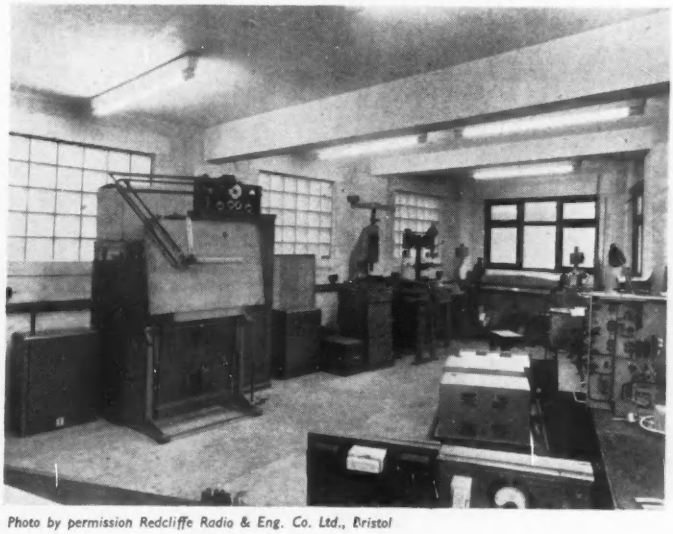
Tax Free—only available for Industrial and Commercial use.



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Thermodare has five outstanding features:—

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Introducing an additional advantage of the Enfield GRID SUSPENSION system

The new 'ENsphere' Lighting Fitting

The original Grid Suspension system provides the very considerable economy that no conduit is necessary and there is a great saving in both labour and materials.

The new 'ENsphere' connection box is integral with the lighting fitting, an additional economy and, as with all Grid Suspension installations, no wires are cut in the making off, all work can be done at ground level, and the completed span lifted into position and tensioned as the installation demands.

Moreover the 'ENsphere' lighting fitting is of new design and, for example, the 300 watt fitting has a light output ratio some 10% higher than ordinary vitreous enamelled steel reflectors. The 'ENsphere' reflectors are made in opal "Perspex" (I.C.I. Trade Mark) in two grades and may be used open or with a visor. This visor is available in opal or clear pinspot diffusing grade "Perspex."

These fittings are manufactured by Enfield Cables Ltd., and Engineering and Lighting Equipment Co., Ltd. (Industrial and Street Lighting Specialists of St. Albans) and may be seen at the Electrical Engineers' Exhibition, Earls Court, Stand No. 8.

The range of 'ENsphere' fittings includes 100/150, 200, 300 and 500 watt lamps.

Enfield

ENFIELD CABLES LIMITED, BRIMSDOWN, MIDDLESEX

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E.37

See us at the show!

A warm welcome awaits you on Stand 98 at the Electrical Engineers Exhibition. The following members of the M E M organisation will be in attendance on the days shown and will be glad to show visitors the very complete display of M E M products.

Throughout the week

R. W. S MACKAY, *Sales Director*
W. LOAT, *Sales Supervisor*
W. F. CARTWRIGHT, *Southern Counties Representative*
J. W. CHAPPELL, A. DYSON, J. J. FALLON } *London & Home Counties Representatives*

Tuesday, 16th

J. A. OLDFIELD, *Export Market Supervisor*
S. D. GUNN, *South Midlands Representative*
F. E. KNIGHT, *North Midlands Representative*

Wednesday, 17th

J. A. OLDFIELD, *Export Market Supervisor*
A. M. PERKS, *West of England & South Wales Representative*
J. G. WRIGHT, *Northern England Representative*

Thursday, 18th

J. G. DAVIS, *Export Manager*
A. D. K. BAKER, *Yorks & North Lincs Representative.*
G. GROVE, *East Midlands Representative*

Friday, 19th

J. G. DAVIS, *Export Manager*
L. R. PIPER, *Scottish Representative*
J. W. WATERHOUSE, *Lancashire & North Wales Representative*

Saturday, 20th

A. AYRES, *Export Assistant*

MIDLAND ELECTRIC MANUFACTURING CO. LTD.,
Tyseley, Birmingham 11. *Branches in London & Manchester.*

Visit MEM Stand 98

AT THE ELECTRICAL ENGINEERS EXHIBITION

EARLS COURT MARCH 16-20

(Stand Telephone: FULham 4776)

incorporating three vertically isolated type VIH oil break switchgear units and a load break oil switch type V1. For medium voltage systems is seen a four circuit type MC board whilst in the e.h.t. class comes a model of one phase of a t.p. 275 kV air-blast circuit-breaker of the type supplied for the Staythorpe-Carrington section of the super-grid. Conversion is represented by a rectifier unit taken from the mid-point in their range of m.a. rectifiers. No. 31.

Metway Group

Under this generic heading, three companies display items, of particular interest being a polished aluminium kettle being introduced to the market. A two pint model this is the baby brother to their DA/499 full size kettle. No. 172.

Midland Electric Manufacturing Co.

Visitors to M.E.M. stand will be able to see their "Autoline" starter, being shown to the trade for the first time. A heavy duty unit of high quality and attractive appearance, the "Autoline" gives direct on line starting for machine tools and similar equipment, and a new type of thermal O/L trip is incorporated. No. 98.

M.K. Electric

A great variety of designs of wiring accessories are being exhibited, some for the first time. Of particular note is the comprehensive range of a.c. accessories whilst 13 amp types are also featured, the display as a whole emphasising finish and ease of maintenance. No. 70.

M.T.E. Control Gear

This firm are introducing four products now available to the trade, of which one is a contactor designed for high duty cycle operation. Two others comprise contactor equipments which have been supplied to the Admiralty. There are also typical examples of specially designed automatic control panels, including a demonstration unit. No. 123.

Millett, Levens

For industry generally, this firm of engravers display examples of their work to depict the service they offer. Many types of engraving are undertaken, and examples of their output are seen in chemically engraved, double anodised, printed, embossed and cast nameplates, dials, scales and other items. No. 169.

Nelson Engineering

An interesting exhibit on this stand is a small air cooled transformer having a die cast aluminium case to ensure that if the unit were accidentally dropped on to steel or concrete no spark would be generated. During tests the unit fell through 20 ft and was stated to suffer no material damage beyond slight distortion of the case. No. 95.

Nettle Accessories

Sharing a stand with their associated company, Aerialite, this firm's display of wiring accessories includes lampholders, ceiling roses, a.c. switches, architectural fittings, transformers, inspection handlamps and 13 amp plugs and socket outlets. On show for the first time are rubber sockets and plugs for industrial use, together with a rubber adaptor. No. 151.

Nevelin Electric

Featured on by this company is the latest type of "Varionic" drive incorporating Nevelin single anode m.a. rectifier tubes. Suitable for direct connection to three-phase supplies up to 440 V, this unit is self-contained with grid control and motor protective gear for handling wide speed ranges at drives of up to 75 h.p. No. 48.

New Day Electrical Accessories

No new items are to be seen this year, the emphasis being given to versatility of this company's present range of accessories. These items are fully represented, particular units being micro-gap multi switch assemblies, micro-gap tumbler, pilot control and micro-limit switches besides many others for a.c. use. No. 74.

Oliver Pell Control

Among the group of companies exhibits on this stand, there is being shown a new range of relays by Besson and Robinson. Operating on a.c. or d.c., their construction gives a buzz/3 operation. No. 128

Partridge Transformers

This year's new products on show include a low voltage lighting unit together with a range of fully protected l.v. lighting transformers, available for 25, 50 and 110 V outputs in sizes from 150 to 1,000 VA. On a more general basis, typical examples of this company's transformer products may be seen, covering many types of requirements. No. 77.

Partridge, Wilson and Co.

Diversity of application is explicit in the types of "Davenset" rectifiers which can be inspected. Visitors will see units for electro-plating supplies and aircraft jet engine starters, to indicate but two possibilities. Transformers include the latest unit, 15 kVA in size, for pole mounting in rural distribution. No. 139.

Philips Electrical

Devoted almost entirely to lighting, this stand has for its theme the versatility of Philips instant self-start fluorescent lighting system, and some interesting uses are seen. Making their début, moreover, are a range of contemporary-style indirect and semi-direct lighting fittings using internal reflector bowl lamps. No. 33.

Porter Electrical Products

The common installation bugbear, earth continuity receives most of the limelight by virtue of attention drawn to the "Portaway" earth continuity system. One of its chief features is the "Fulgrip" bonding clamp, a new version of which was recently introduced for bonding to water pipes, whilst none of the clamps used requires any drilling of the conducting strip. No. 155.

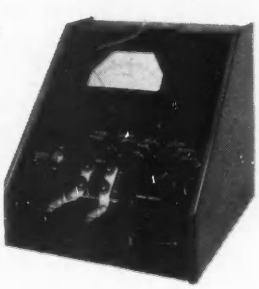
Power Centre Co.

Here the installation engineer may inspect the medium of his craft, all types of equipment being shown in this display of distribution gear. Busbar, trunking, cable trunking, cable-tap system, rising main system, fuse units, bonds, switch fuses, to name but a few, are being displayed. No. 114.

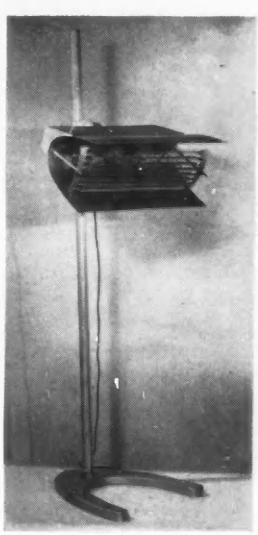
Pyrotenax

Well known to engineers are this company's m.i.c.s. cables, and this year emphasis is given to the use of this type of cable for rising main work. Other illustrations indicate its uses for earth concentric wiring, catenary systems. No. 103.

Left, the Bryce power factor tester and below Siemens' infra-red industrial drying unit



Left, Clare Instrument Co.'s wide range ohmmeter



"Quickdraw" Co.

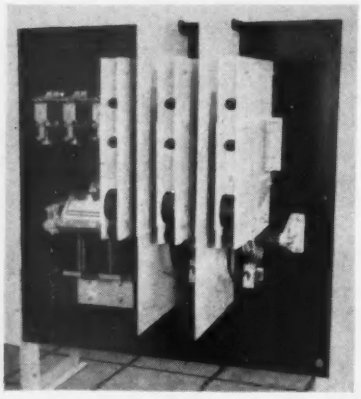
For the engineer whose work is mainly carried out at the drawing board, this company show their ingenious instrument designed to assist in precision drawing. With the aid of a blank supplied with the device it is now possible to draw electronic symbols. No. 40.

Radio Heaters Ltd.

Examples from the three main branches of "Radyne" h.f. electronic heating equipment are demonstrated, a unit on show for the first time being a 6 kW output induction heater whose design makes it essentially an item of production plant. For welding thermoplastic sheet on a production scale are two units, 2½ and 6 kW, operating at a frequency of 40 Mc/s. No. 173.

Ranton and Co.

For the domestic installation electrician, the range of "Rock" moulded electrical accessories being shown indicates the variety of patterns available. Lampholders of different types, for b.c. and e.s. lamps, ceiling roses, plugs and socket outlets, various adaptors and connectors, and lighting fittings provide a comprehensive display. No. 146.



3·3 kV air break direct switching contactor for 1,000 h.p. motors by Watford Electric. Make and break capacity is 25 MVA

Rawlplug Co.

As in previous exhibitions this company will be showing their wide range of fixing devices and tools which can be applied to cover many requirements in electrical engineering. The engineer visiting the stand is able to judge the merits of the tools by carrying out tests on masonry erected on the stand. No. 124.

Record Electrical Co.

Prominently displayed on this stand are the company's "Cirscale" instruments which range in dial size from 2¾ in. to the mammoth 30 in. Recent developments in this range are meters fitted with platform scales and domed glass whilst a series are seen fitted in the "Services pattern" hermetically sealed case. No. 45.

Revo Electric Co.

Recent additions to Revo equipment which can be seen include a new type dust-proof fitting for 80 watt fluorescent lamps, whilst a blended light fitting for mercury vapour and tungsten lamps. A special heavy duty unit—the "Becton"—for sodium lamps has an internal portion arranged to permit the fitting's use for floodlighting, street lighting or as an industrial dispersive fitting. No. 158.

A. Reyrolle and Co.

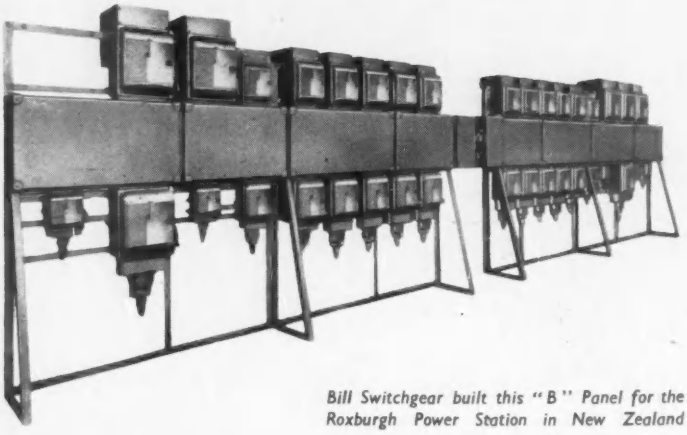
Switchgear specialists will find much to attract attention on the Reyrolle stand, the largest panel on show being one of their type C6T, 250 MVA horizontal drawout metalclad units for 11k V systems. Having a special "Perspex" mechanism cover together with a window in the tank wall, operation and contact details of the spring-operated circuit-breaker unit may thus be inspected. No. 7.

Rheostatic Co.

For the designer whose main concern is water heating appliances, Rheostatic feature the "Satchwell V" thermostat. An enlarged model of the switch mechanism shows the layout of the micro-gap switch, its snap action being controlled by a permanent magnet. No. 140.

Rolls Switches

Here, we understand, 5 amp switches in round surface, flush and gang types together with other items of switchgear are on display. No. 130.



Bill Switchgear built this "B" Panel for the Roxburgh Power Station in New Zealand

Sanders (Wednesbury) Ltd.

Interest is centred on "Sandaclad" fused switches, on show for the first time in exhibition form, which were introduced to the market at the beginning of the year. Accessories, in the form of a 13 amp plug moulded in rubber and other unbreakable plugs may be viewed, whilst the installation engineer can inspect the recently introduced "Sandasteel" fuseboards. No. 80.

Santon Ltd.

Principle attraction on the Santon stand is their 300 amp rotary switch, an on-load unit of high rupturing capacity. Designed for panel mounting, this switch provides a wide range of switching sequences whilst auxiliary contacts for remote indication or electrical interlock may also be added. Another exhibit exciting interest comprises a range of greenhouse heating equipment. No. 65.

G. H. Scholes

"Wylex" accessories and switchgear on show include a range of switch fuse control units for domestic installations. They are available with 8, 6, 4, 3, 2 and 1 ways and assembled with 5, 15 and 30 rewireable or cartridge fuses. In the same sphere come the "Wylex" and "Sonex" cooker control units, a.c. switches and a 20 amp 500 volt t.p. isolator. No. 129.

Scottish Cables Ltd.

Here the installation engineer may view the various types of cable—paper, rubber and plastic insulation—made by this company together with jointing accessories and materials. Particular attention is merited by display units illustrating the uses of farm and domestic wiring cables. No. 75.

Service Electric

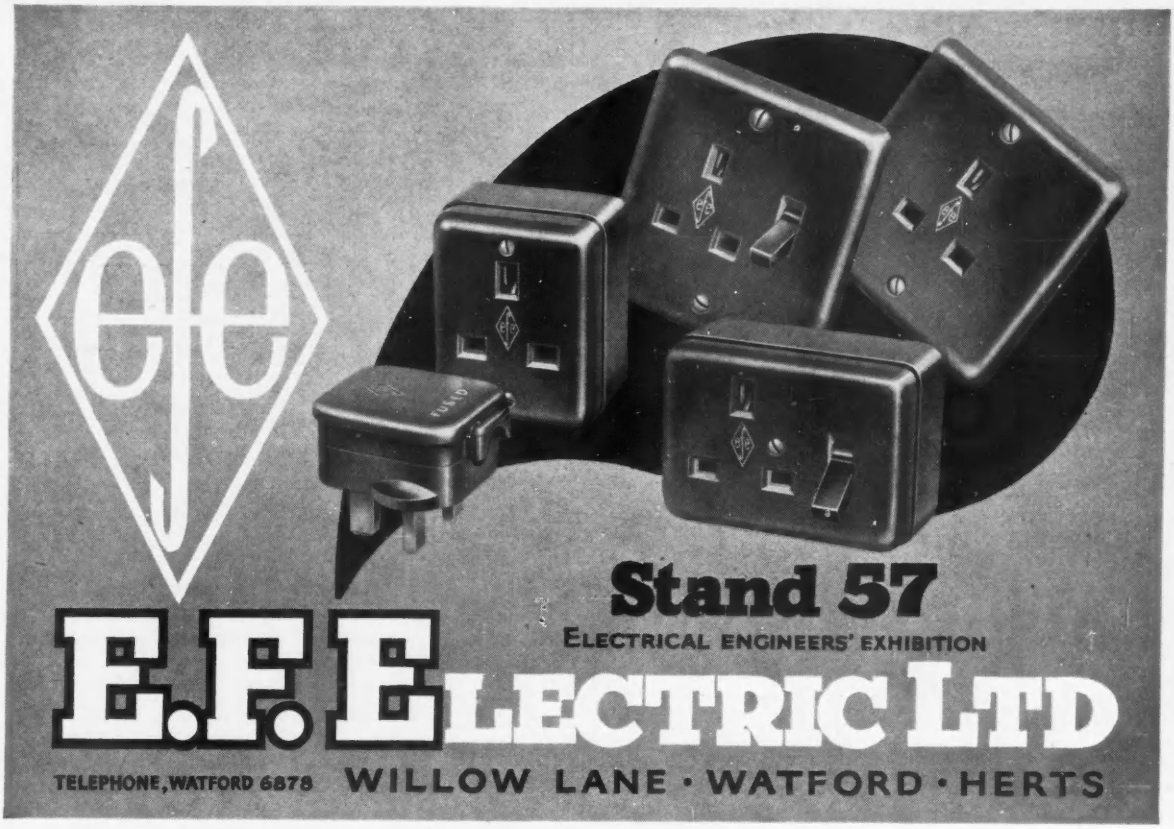
Exhibits on this stand provide indication of manufacturing, contracting and repair activities of this company, new products on show being two models of their industrial vacuum cleaners. The standard heavy duty model (51), moreover, is now available in an improved version which operates silently. No. 96.

Siemens El. Lamps and Supplies

One of the several new products being shown consists of a portable infra-red industrial drying unit suitable for many industrial applications. Comprising a reflector assembly and four 250 watt infra-red lamps, the unit is mounted on a steel pole with provision made to vary its height to suit local conditions. In the lighting display the feature is the new "social colour" warm white fluorescent lamp. No. 141.

Simplex Electric

Being shown for the first time is a range of ironclad switches, the display including standard one to twelve gang patterns together with multiple gang units up to a 96 gang, 8 amp switch fitting. The "Regent" range of switchgear is well to the fore, its flexibility and adaptability demonstrated by the use of adaptors to mount units direct to disboards and trunking without the use of framework. No. 35.



Stand 57

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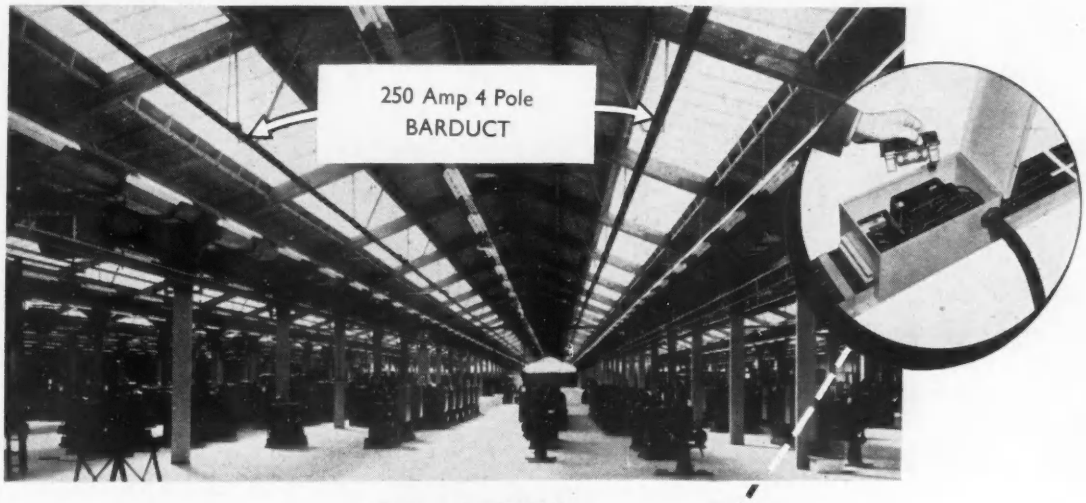

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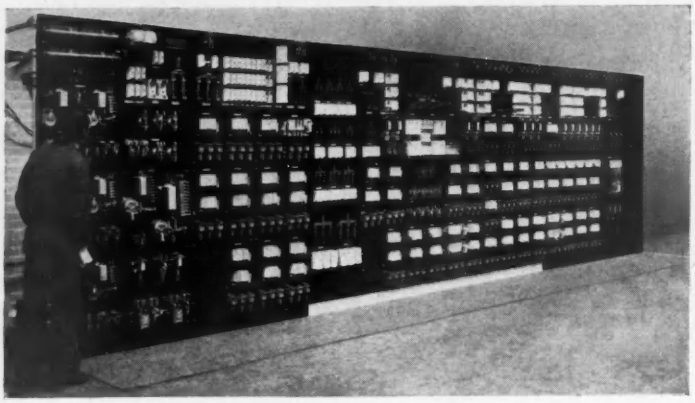

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STAND 20

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Standard Telephones and Cables

For the control engineer this stand will appeal by virtue of the impulse frequency telemetering system which is displayed but the exhibits, generally, cover a wide range, from p.f. correction to control and test apparatus. Perhaps greatest interest, however, will devolve round the application of germanium transistors to light power work. Here a Post Office type telephone relay operates directly from a germanium junction photo-electric cell, the associated power unit using germanium junction power rectifiers. No. 47.

J. G. Statter

Pride of place in this display of switchgear goes to a h.v. metal-clad, air insulated, drop-down drawout unit employing an oil immersed c.b. of 250 MVA. The latter is arranged for spring closing and is shown fitted with cross jet arc control contacts. No. 159.

Sun Electrical

To meet the diverse needs of contractors and works engineers, this firm of wholesalers present a carefully selected display ranging from electric pumps to lighting fittings. This variety of equipment on show indicates well the extent of the service the company offers. No. 88.

Sunvic Controls

Domestic products feature prominently on the Sunvic stand, of particular interest being a new water heater thermostat, designed to meet the demand for simple immersion type units, which is set to a predetermined temperature and may be withdrawn without draining the system. No. 34.

Switch and Control Co.

Electricity supply is featured in a variety of high and low on and off load tap changing switches and selector switches. Meriting attention in the last group is the type 507 distribution switch available for either five or seven positions for bridging as a single unit. No. 145.

Synchronome Ltd.

Timing equipment shown here, we understand, includes master clocks and power station timing units, recorders and watchman's clocks together with tower clocks and electronic chimes. No. 92.

Telegraph Condenser Co.

Featuring the use of static capacitors for p.f. correction, this company demonstrates, with the aid of a lightly loaded motor of p.f. adjusted to 0·5 lagging, the reduction in current and kVA when the p.f. is corrected to 0·95. Another demonstration depicts a system of automatic p.f. correction, employing kVA sensitive relays which switch in appropriate capacitance when the p.f. falls to a predetermined lagging value. No. 174.

Tel. Maintenance and Construction

Cable specialists will be attracted by a new type of 11 kV polythene insulated self-supporting aerial cable which is shown with appropriate fittings designed for use in rural supply. Polythene insulated h.v. cable of the type recently installed at the new Queen Elizabeth II oil dock at Eastham may be seen. No. 17.

Thermodare (Gt. Britain)

For the first time at the A.S.E.E. exhibition is shown the "Thermodare" thermal storage heater which, designed for use at off-peak load periods, demonstrates many of the advantages of electric heating. To the original 1 kW and 1½ kW models has been added a 2 kW unit, providing a range to meet most types of industrial and commercial space heating requirements. No. 54.

Thorn Electrical Industries

On the "Atlas" stand the principal exhibit describes the production of phosphors for fluorescent tubes showing methods employed to ensure high quality and efficiency. Of the fittings displayed there is a new range of single and twin tube 5 ft 80 watt "seagull" units, whilst the 2 ft 20 watt "pin-up" fitting for domestic or commercial use over shaving mirrors bed-heads and elsewhere, is likely to find many admirers. No. 149.

F. W. Thorpe

Recently developed by this company is the "Slyda-long" system of continuous fluorescent trunking. One of this unit's features lies in the ability of the reflector fittings to be slid into any desired position. No. 170.

T.M.C.—Harwell

For installation work, the centre of attraction lies in the 1954 range of "Temco" a.c. switch sockets and plugs. Available in 5 and 15 amp sizes, in single and double pole units, these accessories incorporate a micro-gap snap action for switching on both make and break. No. 71.

Trevelyans (Birmingham)

Manufacturers of electrical accessories, Trevelyans display examples of their capstan and press work in brass together with a full range of lampholders, in b.c. and e.s. fixings. Also on show are samples of watertight and standard flexible metal tubing with adaptors. No. 107.

Tricity Cookers

Exhibited on the Thorn stand the "Tricity Queen" cooker is making its first appearance at this exhibition. Automatic pre-setting features on the oven regulate both cooking period and time of switching on, with "Simmerstat" control on all hotplates making this attractive cooker a suitable aid in any kitchen. No. 149.

Troughton and Young

Featured on this stand, we understand, is a display of lighting fittings for domestic, commercial and industrial applications, whilst associated companies are also represented. No. 125.

J. H. Tucker and Co.

Several new exhibits are being displayed, foremost among which are "Five-eight" a.c. flush switches of the popular plaster depth type, available with moulded plates mounted in a ⅝ in. deep wood or pressed steel box. No. 97.

Uni Tubes Ltd.

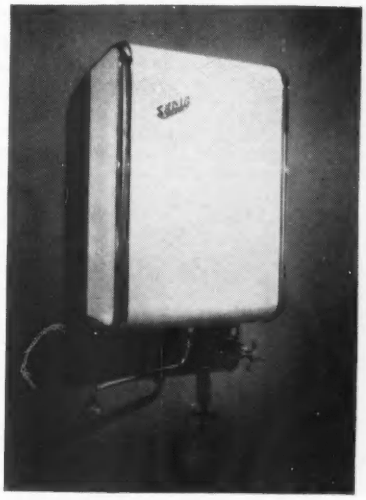
Designed to minimise installation time, "Kopex" flexible conduit displayed on this stand employs layers of continuous metal and paper strip, or spirally wound metal strip to give flexibility enabling it to be bent to almost any radius. No. 106.

Varilectric Ltd.

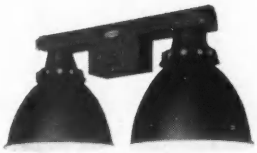
Representing their general range of switchboard design, this company show a cubicle pattern switchboard taken from current production. The unit illustrates the method of assembly and the ease of installation and maintenance. No. 167.

V. G. Porcelain Co.

This "Ashley" group member company display examples of their refractories and porcelains for industry. Notable in their exhibit are the silver, nickel and platinum metallised ceramics used for seals. No. 112.



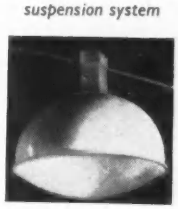
The new Sadia "Select" water heater by Aidas Electric



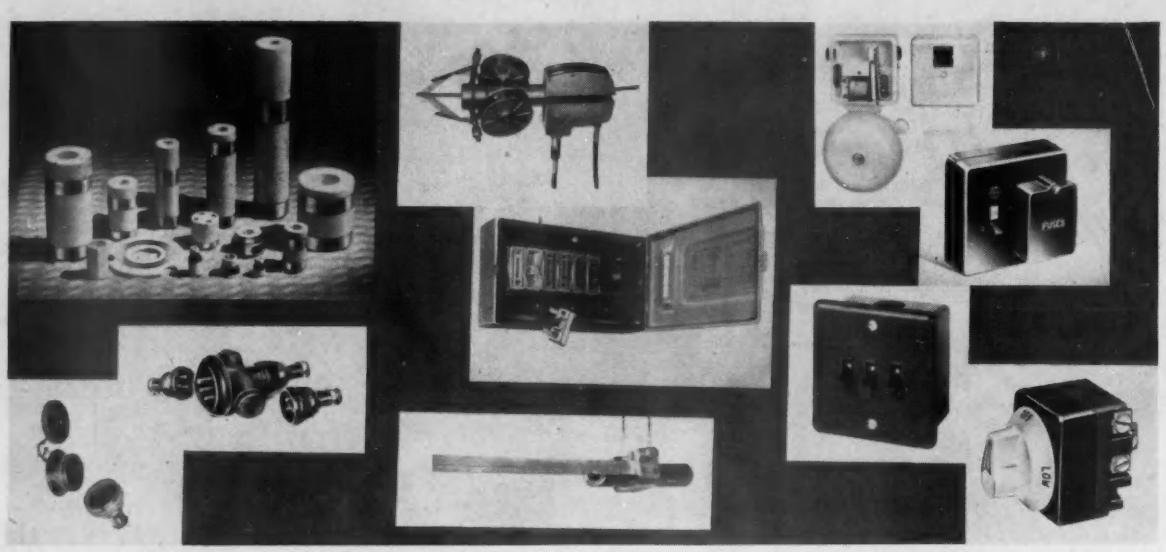
This "Blendolite" blended light fitting is by Benjamin Electric

Revo's unusual "Hatfield" Class B Lantern

Enfield Cables have produced this new "ENsphere" fitting for use with their grid suspension system



Holophane's "Steplite" close ceiling fitting unit with 14" diameter glass for four 100 W lamps



Examples of V. G. Porcelain silver-platinum and nickel metallised ceramics are shown above a Nettle 5 amp and 2 amp rubber adaptor and a 5A 15 pin plug and socket which is a new line by Wm. McGeoch. In the centre are seen the Martindale LDC taping machine head, a 6 way consumer's unit by B. I. Callenders Cables and the Portaway "Fulgrip" bonding clamp. On the right are a 6 in. iron clad bell—a new line by Agro Electric, a "Wylex" 2 way all insulated fuse unit, Kersons 3 "Uniquail" 5 amp a.c. switches moulded in a B51299 box and a new three heat cooker switch by Diamond H

W. G. Walker and Co.

Ranging over products in sheet metal and fabricated steel construction, the exhibit features metal installation accessories, of which cable trunking, overhead busbar systems and control panels are typical examples. Another activity is seen in the paddle type fan brake dynamometers for testing electric motors. No. 72.

Walsall Conduits

Safety figures prominently in this display of installation equipment and accessories, particular items being a complete range of "sparkless" switch gear for use in hospitals. Apart from standard units, there can be seen a three heat switch of this type suitable for controlling sterilisers and similar operating theatre equipment. No. 10.

Wandsworth Electric Mfg. Co.

Many new 1954 items are displayed, including a demonstration of the "Bunnie" incinerator which should excite considerable interest. Consuming only 4 amps on a 200/220 or 230/250 volt supply, this unit is stated to be capable of handling refuse from 50 to 60 persons. No. 22.

Watford Electric and Mfg. Co.

In the control gear on show on this stand, the large motor design engineer will undoubtedly be attracted by a new 3·3 kV direct switching starter unit, one of several new products. Designed for use on squirrel cage motors up to 1,000 h.p. in size, this A.S.T.A. tested unit enjoys a making and breaking capacity of 25 MVA. No. 99.

Westinghouse Brake and Signal Co.

Rectification by various methods is the Westinghouse theme, units ranging from a "Westalite" rectifier for d.c. injection braking of a motor to the "Westruk" transportable ground power unit for aircraft. No. 121.

Westwood Switchgear

Here the display is devoted entirely to the "unit assembly" type of switchboard manufactured by this company. An appealing feature of this gear is the symmetrical assembly of units, which themselves are built in multiple sizes to ensure symmetry in any combination. No. 147.

Henry Wiggin and Co.

One of the principal activities of this firm is seen in the display of electrical resistance materials which illustrate the modification of the original 80/20 Ni-Cr material to meet special operating conditions. One such type is "Brightray C" developed for the intermittent duty met in heating appliances, whilst "Brightray F" is a later composition designed to operate in carbonising conditions. No. 76.

Woden Transformer Co.

For the instrumentation specialist, a recent Woden development in the form of current and voltage transformers made to Classes "AL" and "B" accuracy is of special interest. More generally, exhibits include a 200 kVA transformer with on-load tap changing. No. 133.

Woods of Colchester

Originally designed to meet marine requirements, the Aerofoil "Maxcess" fan, now available for general industrial use, excites attention in the means by which the motor is given maximum accessibility. The fan is a retractable axial flow unit carried on hinges in a main casing flanged at each end for fixing. When servicing or inspection is required the fan unit is merely swung out on hinges from the casing. No. 39.

Non-Manufacturing Organisations

Looking round the stands of non-manufacturing organisations, for the ladies the E.A.W. (14) show by means of its publications, classes and other activities how the Association carries out its two main objects to ensure that every woman appreciates the value of electricity and of representing the woman's point of view on electrical matters. Nearby on stand 16, the E.I.B.A. has a volunteer-manned information bureau from which full details of the Association's progressive social service throughout the industry can be obtained. The engineer desirous of technical literature will find an informative display on stand 18, shared by Chapman and Hall, and Methuen and Co.

E.D.A. on stand 25 portray the valuable service they give in their Leatherhead Testing House. Practical demonstrations illustrate routine life tests of commonplace electric appliances, together with a demonstration indicating the measurement of heat output of an electric fire. The B.E.A. (28, 94) feature the growth in demand from 1920 to 52, illustrating some of the Supply Industry's achievements since vesting day. The special attention paid to switchgear at the exhibition is reflected on the E.R.A. stand (26) by a section showing specialised equipment developed for c.b. research. Originators of this exhibition, the A.S.E.E., display on stand 27 publications referring to their activities.

Of these displays, that of the Department of Atomic Energy (163) provides probably the greatest appeal for the engineer, who is given a glimpse into the future of electricity generation. A model on show here indicates the final appearance of the experimental power station at Calder Hall. A.E.M.T. (24) feature the nation-wide coverage provided collectively by their "doctors of the electrical industry." Representing the leading cable manufacturing firms in the country, C.M.A. (6) display examples of cables for all types of application, plastic insulated cables being a prominent feature whilst B.E.A.M.A. provide a reception area for their members and guests on stand 13.

notes on wiring

by Megohm

DURING the recent cold weather, the conversation in my railway carriage naturally turned to heating systems. Practically every known type of system was discussed and one of my fellow travellers was most enthusiastic about a heating system recently installed in his factory and invited us all along to try it out. Not being too impressed by the system in use on our railways, I accepted his invitation, more with an eye to thawing myself out than finding material for these notes, I admit! The system had been described to me as a hot water operated type, and I therefore did not visualise any outstanding electrical work in connection with it. How mistaken I was, for as soon as I entered the factory it was plain that my interest would be in the electrical side.

The system consisted of hot water operated unit heaters, with a small three-phase fan behind each heater to disperse the hot air throughout the factory. The large bays in the factory had four of these unit heaters, and the smaller bays two only. The unit heater fans in each bay are controlled by a thermostat during the heating season but this can be taken out of circuit during the summer, so that each fan can be operated individually by its own starter.

Unit Heater Control

All this presented the consultant with the problem of siting at each control position in each bay at 15 amp t.p. and n. isolator, a t.p. contactor, one t.p. starter per motor, a thermostat and a miniature type circuit-breaker controlling the thermostat. To complicate matters further, all the control positions were sited on the steel columns, and together with the conduits required to feed the position and those required to carry the wiring to the fans, there was quite a collection of apparatus to contend with. A formidable problem indeed, when one considers the amount of wiring required.

The consultant had really risen to the occasion and, in my opinion, solved the problem in a way which gave the client a neat, tidy job and, at the same time, greatly assisted the contractor. He had arranged for a fourteen gauge sheet steel box to be installed at each position, the box to be fitted with a lid hinged completely down one side and a suitable locking device. The lid of the box carried all the control gear previously described and I estimated the gear to weigh some twenty-six pounds. I carefully checked on one of the boxes if the door showed any sign of strain and found it quite the opposite.

With the exception of the starters, it had been quite easy to arrange a back entry to the controls. The starters, on examination, showed that back entry to them was out of the question and a wiring channel sized 3 in. by 1¼ in. deep had been incorporated in the lid and the starters mounted two above and two under this channel. The back of the channel was completely open and easily accessible with the box door open. The size of each box to accommodate gear for four fans was 33 in. long, 11 in. wide and 2 in. deep. The boxes were securely fixed to the steel columns and I was pleased to note that precautions had been taken to ensure that the weight of the box was not taken on the conduit drops. The lid of the box could be easily opened to an angle of 90 degrees, and the internal wiring to the controls had been neatly taped in such a way that I found it impossible to damage the cables by catching them in the door when I closed it. Naturally the earthing arrangements were examined closely, and I found them very satisfactory indeed.

I consider this to be one of the neatest arrangements I have seen in a factory for some time, so often, in my opinion, insufficient planning goes into such arrangement and the result is usually an untidy collection of switchgear, elbows and bends.

Earthing

I was pleased to read recently that one more make of earthing clamp which complies with the British Standard Specification is now available to the trade. This means that at least two makes are now obtainable by contractors who have undertaken to carry out installations which comply fully with I.E.E. Rules and Regulations. I feel that the inspecting engineers who test such installations should be much happier now. One manufacturer has been making clamps to B.S. 951 : 1948 since 1950, but little notice has been taken of the fact.

Contractors have found it almost impossible in the past to comply fully with the Regulations in this matter of earthing, but I hope that they will make full use of the clamps now available. Consultants too are rather inclined to skip this important detail and rely on the contractors to deal with it. Perhaps if plumbers were to run water pipes in more accessible positions, the earthing clamps would come under closer scrutiny. I see no reason why all earthing clamps should not come up to B.S. Specification, as they are an important part of any electrical installation and apparently quite easily manufactured.

Switch-sockets

A representative for a firm of accessory manufacturers recently asked me if I thought the demand for 15 amp sockets in buildings would be decreased in view of the benefits derived from 13 amp sockets wired to form a "ring main." I did not venture to give him a definite answer because of the many factors governing the type of sockets to be used in installations. Where extensions are being made, there is obviously a need for keeping sockets standard with those in the existing building.

I could go on quoting instances such as the one above. Many electrical installations, such as those on housing schemes, are often under the control of an architect and naturally the 13 amp socket ring main appeals to such people because of the saving in cost. Unfortunately, cases have been known where unscrupulous contractors have taken advantage of the architect's inexperience of ring main installations and the results have not shown any saving in costs. I shall be taking note at the forthcoming Electrical Engineers' Exhibition of the manufacturers who have this problem in front of them, and are assisting architects who have little knowledge of this cost-saving method.

Measurement of Iron Losses

Different Aspects Described at I.E.E. Meeting

TWO papers, presented to the I.E.E. last week, dealt with somewhat widely separated aspects of the problem of iron loss measurement. Of these the first by PROF F. BRAILSFORD, was of immediate practical importance to the transmission and distribution engineer. This was "Current and Power Relationships in the Measurement of Iron Losses in a Three-Limb Transformer Core."

Core Assymetry

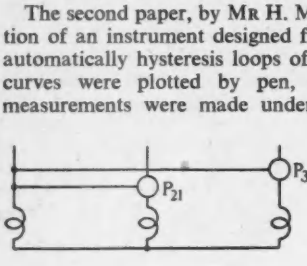
The introduction to the paper pointed out that the 3-core transformer of the ordinary kind was magnetically asymmetric, as the centre phase had a magnetic path which was much shorter than the paths of the two outer phases. When measuring iron losses by the two-wattmeter method, due to the low power factor of the material in the core at working flux densities, it was necessary to take the difference between two readings, each of which, individually was greater than the total iron loss of the core. Taking into consideration, however, the phase sequence of the voltages and currents, it was possible to connect up the wattmeters in three different ways, giving three different sets of readings. Neglecting errors, the difference of the readings would be the same in all three cases, but one of the methods was essentially the best, as the wattmeter readings in this case were the smallest and the required difference relatively the greatest. Should a 3-wattmeter method be employed the magnetic inequality of the three phases also caused two of the wattmeters to have high readings, one of them being negative at high flux densities.

If the wattmeters had a phase-angle error, owing to the time constant of the voltage-circuit, errors in the wattmeter readings would naturally occur, and would increase as the power factor decreased. Except for the wattmeter in the centre phase with the 3-wattmeter method, all other meters would operate at power factors different from that of the core material itself.

The purpose of the paper was to provide an analysis of the measurement problem which would take into consideration these error sources. The conclusions arrived at were that the best method of connection for the 2-wattmeter method was that shown in the diagram. The 3-wattmeter system was, however, even better. The error in the observed total iron-loss due to phase-angle error, was the same for any of the wattmeter methods. Wattmeters of substandard and first-grade accuracy could give errors in total iron-loss for cores of hot-rolled transformer iron, of the order of 2% and 5½% when B_{max} =1·35 webers/sq metre (13,500 gauss) and of 4% and 11½% at B_{max} = 1·45 webers/sq metre respectively.

Plotting Hysteresis Curves

The second paper, by MR H. MCG. ROSS, gave a description of an instrument designed for the purpose of plotting automatically hysteresis loops of magnetic materials. The curves were plotted by pen, directly on paper. The measurements were made under virtually zero-frequency conditions, the period of the cycle being nearly one minute. A search coil on the sample was used to detect the magnetic flux, the resultant e.m.f. being amplified and then integrated by a variable-speed motor on a plotting table, the pen displacement then being a measure of the magnetic induction. The instrument was calibrated in terms of voltage and time, which offered good absolute accuracy. Comparative experiments against a fixed mutual inductance and a Hibbert magnetic standard showed agreement within 1%. Appendices to the paper give details of the sensitive servo system used for plotting, considerations for the design of a galvanometer which would be relatively free from mechanical disturbances and the design of the optical system for a galvanometer photocell amplifier.



This diagram shows the best method of connection (to minimise errors) using the two wattmeter method

DISCUSSION

The discussion mainly centred on Mr Ross's paper, and was opened by PROF J. GREIG (King's College) who said that after seeing instruments of the type described by Mr Ross in the U.S.A. he determined to have one made for his own laboratory. It would, however, have to be much cheaper and simpler than the one described. MR D. C. GALL (H. Tinsley and Co.) disagreed that a sacrifice could be made in the sensitivity of the galvanometer because of the galvanometer amplifier. He thought that there would always be a balancing error. PROF MACGREGOR MORRIS, who was unable to be present, recalled, through Prof Greig, some of the early experimental work done in the plotting of hysteresis loops. MR H. A. HUDSON (Underwater Detection Establishment) spoke as one who had been using the automatic plotter for the past two years. In the design, consideration had to be given to the most suitable type of instrument for their application. They required an instrument to use in the investigation of a number of materials exhibiting magnetostriction effects, and in particular the variation in coercivity and remanent induction after heat treatment. A considerable number of samples had to be tested, and it was desired to provide a permanent record of the hysteresis loop without recourse to photographic methods. The instrument had given surprisingly little trouble and would plot a loop in about 5 minutes compared with two to three hours for the ballistic method.

DR A. J. KING (Metrovick) remarked that he had developed an apparatus similar to that described for measuring elastic hysteresis loops in resilient materials. The frequency control was by a separately excited d.c. low voltage generator. He speculated on methods of using Mr Ross's instrument on materials with marked directional properties. Mr J. SUTCLIFFE (H. Tinsley and Co.) said that he and his colleagues had been working on similar lines to Mr Ross.

Commenting on Prof Brailsford's paper, MR H. S. PETCH (B.E.A.) mentioned that he had had to provide equipment to test distribution transformers for iron losses. Three wattmeters had been used and surprisingly the iron losses were a good deal less than the figures quoted by the makers.

MR M. WHITEHEAD (Ferranti) reverted to Mr Ross's paper and suggested that in order to avoid difficulty with the constant of integration the cycle should be started with the core thoroughly demagnetised which should automatically allow a zero to be obtained both on B and H scales. The expense of the equipment was mentioned by DR SCHOLEFIELD (Telcon) who said that using the ballistic galvanometer method they could plot B/H loops in a much shorter time than three hours. MR R. A. CHORLEY also commented on the complication of the machine, and said a simpler machine had been developed which was perfectly satisfactory.

The authors briefly replied, Prof Brailsford remarking, that, since steel makers did not deliberately read their figures high, he wondered whether Mr Petch's wattmeters were all right.

Controlling a Large Machine Tool

Electrical Operation of a Boring and Turning Mill for Canada

AN exceptionally large vertical boring and turning mill has recently been completed by Craven Bros (Manchester) Ltd., to the order of The English Electric Co. for their Canadian associates, John Inglis Co., Ltd. With an overall weight of 650 tons, the mill is capable of handling work pieces up to 140 tons, and with diameters of up to 42 ft 6 in. The table can rotate at speeds from 0·15 to 3·5 r.p.m. but provision is made for automatic partial rotation and reversal in the manner of a planing machine.

In all, twenty-eight separate motors and generators are employed to effect the movement and control of the large moving masses and individual motions of the machine, and to prevent mistakes in operation, a complex electrical interlocking system had to be devised. This electrical control equipment was entrusted to Brookhirst Switchgear Ltd., the motors and generators being supplied by The English Electric Co.

The main drive to the table is by two electrically coupled 150 h.p. variable-speed motors with a 3:1 speed range, operated from a single 410 h.p. Ward-Leonard set. The primary supply to the machine is 550 V 3-phase 60 c/s, and the motor-generator set and all smaller auxiliary motors operate at this voltage.

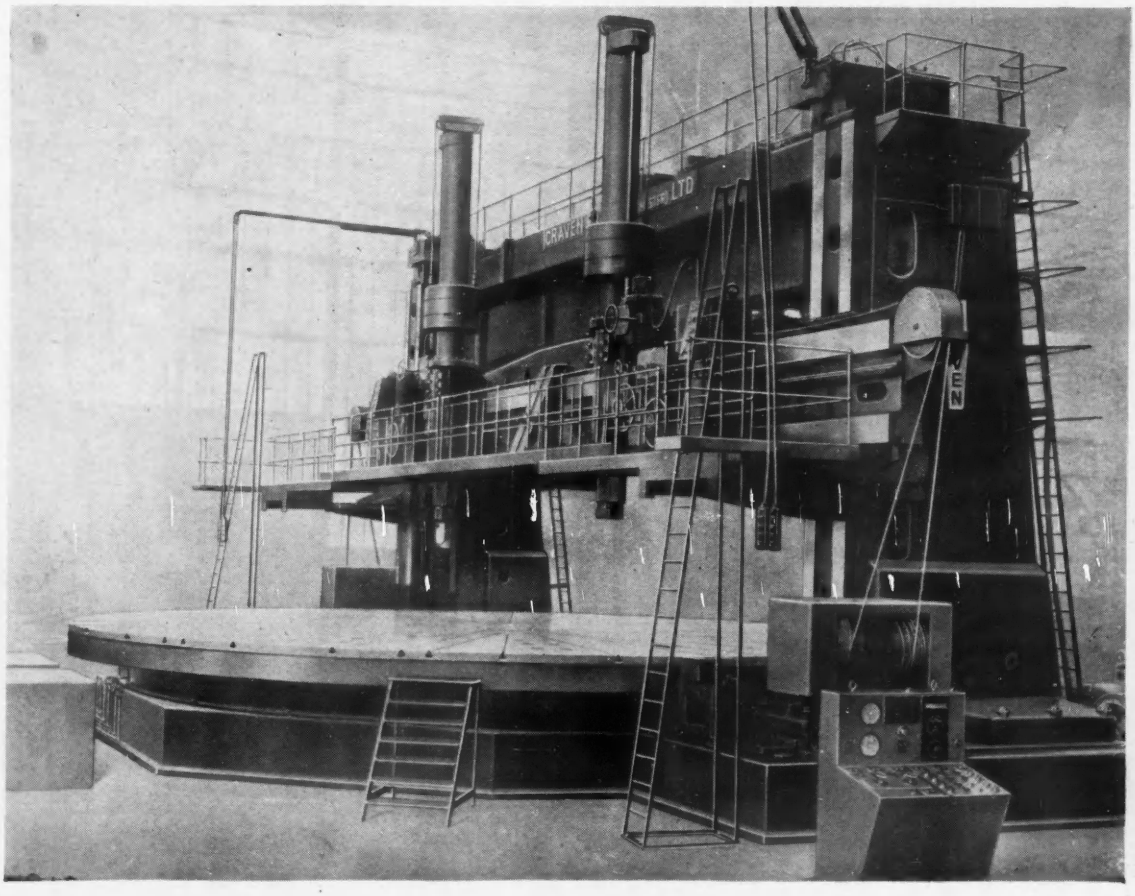
Push-button and control circuits are 110 V 60 c/s supply, and the main motors, feed motors and elevating motor operate on 220 V d.c. obtained from the motor-generator set. This unit comprises five machines—main driving motor, variable-voltage main generator, auxiliary generator (220 V d.c.) control exciter for main generator field, and a constant voltage exciter for the main motor fields and control circuits.

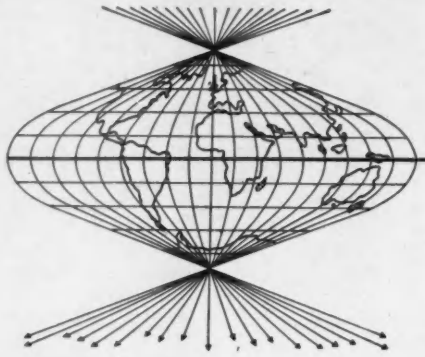
A magnetic amplifier has been incorporated in the system and provides a control over the rate of acceleration and the current taken by the main motors under conditions of starting or reversal. Dynamic braking also is used when the "Stop" button is pressed.

The interlocking ensures that before the table motors can be started, the cross-slide must be locked to the uprights, and the two gear boxes through which the main motors drive must be set to the same ratio. At the same time, the two clutches must be engaged, the main motor fans must be running, the oil pumps must be in operation and spent oil must be flowing from the table. Finally the magnetic amplifier must be in circuit.

A main control desk is provided, together with push button pedestals on each saddle and pendant controls. The main control desk is divided into two sections, one for "setting-up" and one for operating.

Some idea of the size of this large machine tool may be gained from this photograph.





OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Another Dollar Contract

For the Bersimis hydro-electric project of the Quebec Hydro-Electric Commission, the Metropolitan-Vickers Electrical Export Co., Ltd., is to supply four 138,000 kW water wheel generators. The value of this contract, which was obtained in the face of international competition, approached $3 millions. The generators will be the most powerful of their kind in the world, it is claimed. The machines are to be manufactured at the Trafford Park Works of Metrovick, and the first two are to be commissioned by the end of 1956. We reported on 18 Feb. that the English Electric Co. of Canada had been awarded the contract for four 150,000 h.p. hydraulic turbines for this project. The generators are 60 c/s, 277 r.p.m. machines, generating at 13·8 kV, and driven by vertical shaft Francis turbines.

Finance for Expansion

To enable a new expansion programme to be started, the Northern Quebec Power Co. is planning substantial additional financing. The company has applied to the Provincial Electricity Board for permission to create $1·5 million 5½% first mortgage series "B" bonds, $2·5 million 5½% cumulative redeemable sinking fund preferred shares, and 12,500 no par value common shares. The proceeds would pay for an expansion of the company's Quinze River power plant, and would also be used for other capital expenditures and to provide funds to reimburse borrowings. The company completed a 34,500 h.p. extension to its plant in 1951 and it is understood that the new addition will probably be about the same size. The company is a subsidiary of Canada Northern Power Co., which is controlled by the Power Corporation of Canada Ltd.

Manitoba's Next Scheme

A start on the $85 million hydro-electric power development suggested at Grand Rapids, in Northern Manitoba, will not be made until 5 or 6 years' time, it has been stated. Ultimate capacity of the project has been put at 360,000 h.p.—considerably larger than any existing plant in Manitoba. Speaking in the throne speech debate recently, Mr D. L. Campbell, the Premier, without specifically referring to Grand Rapids, indicated that the Government would soon have to consider spending an initial $85 million on a h.e. development, the final cost of which might be over $100 million. In Winnipeg it is adjudged that he had Grand Rapids in mind. The Manitoba Hydro-Electric Board is to make an immediate start on the first 60MW stage of the Brandon steam power station, and present plans provide for the addition of two more 60 MW stages to meet power demands up to about 1965. The proposed Grand Rapids site is near the mouth of the Saskatchewan River on the north-western shore of Lake Winnipeg.

MEXICO

Provision for Expansion

In Mexico's budget estimates for the current year, provision has been made for an expenditure of 445 million pesos on hydro-electric developments. During 1953 about 325 million pesos were spent on such projects. The Federal Electricity Commission expects to obtain a revenue amounting to at least 105 million pesos from its sales of electricity during the current year, compared with 84 million pesos last year.

S. AMERICA

Another Scheme

In Peru, a plan for the construction of a hydro-electric plant in the valley of Mantaro, in the centre of the country, is under consideration. It is claimed that it would be possible to utilise the water power of the falls of the river Mantaro, where irrigation works are at present under construction.

Proposal for Venezuela

Although the proposals for the erection of a hydro-electric plant on the Caroni River, Venezuela, have not yet been finalised, it has been suggested locally that it should be possible to complete the installation of the plant by 1957. At the moment, the proposals provide initially for the installation of one 150 MW generator. Senior officials concerned in the project are now in Canada studying hydro-electric installations there. There is also a proposal for the erection of another power station either in Guanta or Barcelona which would supply the eastern states of Venezuela.

AFRICA

Priority for Kafue

The surveyors' reports on the Kafue hydro-electric scheme are to be presented to the Kafue Hydro-electric Authority by August or September next, Mr R. A. Nicholson, economic secretary to the Northern Rhodesian Government has stated. Three surveying groups are involved, and it is hoped that it will be possible to call for tenders about the end of this year.

At Salisbury, Southern Rhodesia, last week, Sir Malcolm Barrow, Central African Federal Minister of Commerce and Industry, in introducing the Hydro-Electric Power Bill, said that the Government had decided that the Kafue River project should precede the Kariba Gorge and the Shire River schemes as it would need less immediate capital. There was a reasonable prospect of the Kafue project operating in 1960 and later could be incorporated in the Kariba Gorge scheme. The second stage of Kafue would be completed about a year later. Normal output would be about 257 MW. Southern Rhodesia had agreed that the earliest possible construction of the Kafue plant was essential to safeguard the adequate supply of power to the copperbelt and to other industries in the Federation. Negotiations for finance are to be undertaken by the Federal Treasury.

INDIA

Delhi's Electrification

By the end of this year it would be possible to provide electricity to every house in Delhi, the deputy Minister of Delhi's State has announced. Since March, 1952, when the Power Control Board was constituted nearly 50,000 applications for lighting connections and about 7,000 requests for industrial power supplies were received. So far nearly 35,000 lighting and 2,500 power connections had been sanctioned, and the remainder were still pending. But with the inauguration of two new substations now under construction, most of those would be able to have a power supply. The Minister disclosed that the State expected to get 10,000 kW from the Nangal project before the end

of this year, and that amount would be increased next year. Several electrification schemes, he added, would be completed by 1956. The scheme for the electrification of the south and eastern zones which would cost nearly Rs 18 lakhs, would be completed in four years.

Power Plan Proceeds

The Government of Saurashtra, India, has placed orders totalling Rs 60 lakhs, with three foreign companies and certain Indian firms for heavy machinery and equipment for the Saurashtra electric grid scheme in the Sorath district. Machinery from the U.K. and Switzerland, high and low tension switchgear, transformers, boilers and turbo-alternators is expected in India early next year. The Rs 1.5-crore Junagadh-Dhoraji grid scheme, undertaken by the State Government under the Five Year Plan, envisages the establishment of a 6,000 kW thermal power station at Shahpur, 7 miles from Junagadh, and the construction of substations at a number of townships and villages. When fully implemented the scheme will have over 200 miles of supply lines covering 26 towns and villages in the area. Preliminary survey work in connection with the setting up of the Shahpur station has been completed and the construction work is shortly to be commenced.

AUSTRALIA

Cost of the Snowy Scheme

Having studied prices in tenders for the construction of major works on the upper Tumut River part of the project, the Snowy Mountains hydro-electric scheme is now estimated to cost A£422 million compared with the A£225 million estimated in 1948. This information has been given by Senator Spooner, the Australian Minister for National Development. He said that the 1948 Commonwealth State Joint Technical Committee had estimated the cost of the scheme, including power transmission to Sydney and Melbourne, on the basis of the cost of labour and materials at that time. A second estimate, prepared by the Snowy Mountains Hydro-Electric Authority in 1952 put the total cost at A£422·5 million. The difference between the 1948 and 1952 estimates was accounted for by price increases in that period and by a substantial increase in the firm, or guaranteed capacity of the scheme. The 1952 estimate included A£374 million for power generation, up to and including central collecting points within the area. Mr Spooner added that major works for which tenders had been received, together with a dam which was being constructed for the Authority by the New South Wales Public Works Department, would provide N.S.W. with additional generating capacity of 80 MW by 1958 and 320 MW by the end of 1959. In addition, by 1959, there would be a supply of water for irrigation in the Murrumbbidgee Valley.

Appliance Production

An indication of the expansion of local manufacture of electrical domestic appliances in Australia is given in the latest production figures just released by the Federal Statistician. Compared with output in 1952, Australian factories last year turned out about 63,000 more refrigerators, 33,000 more washing machines, 40,000 more electric irons, 15,000 more toasters, 24,000 more hot water jugs, and 60,000 more food mixers. Output of radio sets and radiograms was also 113,000 and 24,000 higher respectively.

NEW ZEALAND

Auckland's Demand

The Auckland Electric-Power Board's electricity bill from the New Zealand State Hydro-electric Department for the last nine months of 1953 was 101% up on that for a comparable period the previous year. Power restrictions had made the earlier power charges artificially low, the general manager, Mr N. M. Speer, pointed out at a meeting of the Board recently. Post, maintenance, distribution and interest costs had all risen, he added. But revenue, too, was higher—by 40%. The new charges were not in operation for the whole period so that revenue position did not yet reflect the impact of the new rates. The operating deficit for the period was £64,213—slightly lower than the estimated deficit. During the nine months ended 31 Dec. last the Board purchased 15·4% more units than in the corresponding period of 1952. Domestic supply had increased by 19·4% to 54% of the Board's total business. Commercial lighting (increased by 25%) absorbed another 4% and commercial and industrial power (up 15%), 35%.

220 kV Line

The 220 kV transmission line between Otahaha and Haywards, in the Hutt Valley, has been completed by the N.Z. State Hydro-Electric Department, and the main substation at Haywards has been placed in commission. The s.c.a. line, some 335 miles in length, was planned about 10 years ago. The line is being duplicated to provide additional power from the chain of stations on the Waikato River now under construction. The first section of the duplicating circuit, between Otahuhu and Whakamaru, is expected to be operating in two or three months.

H.E. Scheme Cost

The capital cost of the Karamea hydro-electric scheme, New Zealand, is estimated by the consulting engineers to the Buller Power Board (Messrs Vickerman and Lancaster) to be £112,000, comprising £77,500 for a power house, dam, and race and £34,500 for the distribution network. The annual cost to cover interest, maintenance, etc., is estimated at £11,200. At last month's meeting of the Board, the engineers recommended a further effort to get more guarantees and also to get a subsidy of 5% from the Rural Reticulation Council on the cost of high tension lines estimated at £23,000. A member of the Board estimated that there would be 63 guarantors at £26 each, 92 at £52, one sawmill which might eventually come in with £750, two other mills at £600 each, one flaxmill at £250, and the dairy factory at £600, a total of £9,222 annually. It was agreed to apply to the Rural Reticulation Cncl.

Extensions are in progress at the Hunts Bay station of the Jamaica Public Service Co., as our accompanying photograph shows. Erected on the shores of Kingston Harbour, the existing station is of the semi-outdoor type, with one 10 MW Brush Ljungstrom turbo-alternator, and a Babcock and Wilcox 130 klb/hr oil-fired boiler. The latter is in the open, only the firing aisle being enclosed. The extensions will comprise a duplication of the first section, the additional boiler being scheduled for operation at the end of this year and the generator late next year. Consulting engineers for the scheme are Ewbank and Partners. Sea-water at a temperature of 90° F. is used for cooling in the plant, provision being made for re-circulation to control marine growth. Generation is at 13·8 kV, 40 cycles, the station feeding into the 69 kV system which is interconnected with the company's hydro station to the north west

Personalities IN THE INDUSTRY

Previously director and works manager, Trafford Park Works, **Mr Arthur C. Main,** B.E., M.I.E.E., has been nominated director of manufacture to the Metropolitan-Vickers Electrical Co., Ltd. **Mr E. W. Steele,** M.I.MECH.E., M.I.E.E., formerly director and general manager of works, has retired from executive duties but remains a director of the company. Born in Adelaide, Mr Main studied at Adelaide University and after taking his B.E. degree, joined Met-Vickers in 1925 as a college apprentice at Trafford Park. At the age of 23 he became foreman of a test department, and after 2 years in charge of time and motion study work in the Process and Ratefixing Department, he was transferred to the Switchgear and Control Departments. In 1935 he was appointed assistant superintendent, and three years later the new Radar Department was included in his duties; here he played a major part in the successful development of this work by the company during the war period. He was appointed superintendent of the Switchgear, Control, and Radio Departments in 1944, and assistant works manager, Trafford Park Works, in 1949. In May 1952 he became works manager and a director of the company. Mr Steele has been with the Metropolitan-Vickers Co. for 35 years, having gone to Trafford Park in 1919 from the Electric and Ordnance Accessories Co., where he was chief electrical machine engineer. For twenty years he was superintendent of Motor Department, and in 1939 he took over in addition Plant Department and G. Coils and Insulation Department. In 1940 he was appointed works manager at Trafford Park, and in 1944 became general manager of Works and joined the board as a director.

Mr A. C. Main

Mr. C. L. G. Fairfield

Mr. E. H. Gosling

Mr C. L. G. Fairfield, M.A., M.I.E.E., A.M.I.MECH.E., Barrister-at-Law, who joined the Telegraph Construction and Maintenance Co., Ltd., in April last as manager of their Overseas Division, has now been appointed general sales manager covering cables, plastics and engineering products. **Mr E. H. Gosling,** A.S.M.A., previously home sales manager of Telcon's Cables Division, has been appointed home sales manager for these products.

In accordance with developments envisaged at the time of the formation of Telcon Telecommunications Ltd., owned jointly by Mullard Ltd. and the Telegraph Construction and Maintenance Co., Ltd., **Mr J. Innes,** C.B., a director of the latter company, has relinquished the managing directorship and his directorship of Telcon Telecommunications Ltd., but will continue to act as consultant to the board. **Mr C. L. G. Fairfield,** M.A., M.I.E.E., A.M.I.MECH.E., Barrister-at-Law, now Telcon's general sales manager, is appointed a director as one of the three Telcon representatives on the board. **Mr W. Sampson,** B.A., A.M.I.E.E., has been appointed executive director and will take take over Mr Innes' managerial duties.

Senior director of Mather and Platt Ltd., **Mr Herbert Taylor** is to retire from that office on 31 Mar.

At present assistant to the sales superintendent, in No. 2 sub area of the North Western Electricity Board, **Mr C. O. Prankerd** has been appointed senior assistant, chief commercial officer's department, Merseyside and North Wales Electricity Board, at Liverpool. Earlier, he was with the Southern Electricity Board in Southampton, and the Watford Corporation electricity undertaking.

Changes in the control of the Vidor-Burndept radio group are announced. **Mr T. N. Cole** has been appointed chairman and joint managing director; **Mr R. P. Richardson,** who has been managing director of the company since its formation in 1934, becomes joint managing director, while **Mr Z. M. Banks** and **Mr R. P. Taylor** have been appointed to the board. Mr. T. N. Cole was managing director of Lissen Ltd. one of the pioneers in the dry battery industry, and was closely associated also with the pre-war development of Vidor-Burndept.

Following the recent resignation of **Mr J. E. Markes** from the position of sales director of Bryce Berger Ltd., **Mr C. A. Edwards** has been appointed sales manager of the company.

Mr A. Barnes has been appointed electrical supervisor (housing) in the Southampton Corporation borough engineer's department.

Ekco-Ensign Electric Ltd. have appointed **Mr T. Haldane-Williams** as their representative covering the counties of Oxfordshire, Buckinghamshire and Berkshire.

The Minister of Fuel and Power has re-appointed **Mr G. H. Johnstone,** O.B.E., D.L., **Councillor S. H. Payne,** J.P., and **Mr L. V. Turner,** M.I.E.E., as part-time members of the South Western Electricity Board.

Previously with Kodak Ltd., **Mr R. W. Unwin** has joined Philips Electrical Ltd., Lighting Division (special lamps dept.), as photographic specialist.

The E.A.W. Diploma in Electrical Housecraft has been awarded to **Miss Rosemary Parkes** of the Midlands Electricity Board, Stourbridge; **Miss K. E. Pennett** of the London Electricity Board, Bromley; and **Miss Hilda Stocks** of the North Western Electricity Board, Ashton-under-Lyne. Miss Parkes gained a first class pass in all three subjects, and a distinction in cookery demonstration.

We hear that **Mr Arthur Foden,** M.I.E.E., M.I.MECH.E., M.(S.A.)I.E.E., is to retire from his position as city electrical engineer to the East London Municipality, South Africa, in September next, on reaching the age of 60. Mr Foden went out to South Africa in 1928 as power station engineer to the East London municipality, became assistant electrical engineer in April, 1937, and was appointed city electrical engineer on the retirement of Mr Mordy Lambe in August, 1939. Prior to going to Cape Province, he was with the Southport Corporation Electricity Department as engineer-in-charge and deputy power station superintendent. Earlier he was engineer-in-charge at the Trafford Park Co., and served at Barton power station, Manchester, with Eccles Corporation

and Metropolitan-Vickers Electrical Co., Ltd. Mr Foden, who has frequently re-visited Britain, hopes to again return on holiday from April to August of next year, we understand.

Works manager of Parmiter, Hope and Sugden Ltd., **Mr H. M. Braithwaite** was recently the recipient of a presentation to mark the completion of his 50 years' service with the company. At the luncheon, held at the Grand Hotel, Manchester, Mr Braithwaite was presented with a Ferranti television receiver as a token of esteem from his directors, and an armchair and travelling case from

Mr Eric Sugden (right) wishes good luck to Mr H. Braithwaite

members of the staff and works. In proposing the health of Mr Braithwaite, **Mr Eric W. Sugden,** B.SC.(TECH.), M.I.E.E., chairman, pointed out how, fifty years ago, the electrical industry was regarded as an adventurous career for boys, and one which in those days occupied the same place in their minds as atomic energy and supersonic flight today. Members of the board of Parmiter, Hope and Sugden Ltd., present at the dinner included **Mr J. V. G. Hope,** T.D., A.I.A.C. (director and secretary), and **Mr G. A. Long** (director and London manager). Of the 110 members of the company at the dinner, 50 could claim over 20 years' service. This figure represents about 20% of the total of employees.

Mr P. H. Scrine, who was personal assistant to the manager for India and Pakistan of W. T. Henley's Telegraph Works Co., Ltd., has recently been appointed assistant manager for India for the company.

Mr R. D. Maynard has been appointed as district engineer in the Scarborough district of the North Eastern Electricity Board's York sub-area, in place of **Mr P. Field.**

Mr J. G. Beevor has resigned from the board of Elliott Brothers (London) Ltd. This follows his appointment as managing director of the Commonwealth Development Finance Co. Mr Beevor was a nominee director on the board of Elliott Brothers of the Bendix Aviation Corporation of Delaware, U.S., who have a substantial holding in the company and are empowered to appoint three of the ten directors. Elliott Brothers also announce that **Mr C. McFadyean** has been appointed a director of the company.

S. O. Bowker Ltd. have appointed **Mr H. Atherton** as area manager for the North West counties and North Wales, operating from their Manchester office at 85 Moseley St. **Mr Rigby,** after many years' service with the company as manager for the North Western area, has asked for his duties to be lightened, and will in future concentrate largely on internal office affairs. Mr Atherton, who takes up his appointment on 15 Mar, is a past chairman of the Manchester Centre of the Illuminating Engineering Society, and was the senior engineer in the North West for Benjamin Electric Ltd. Prior to this, Mr. Atherton was engaged in the electrical contracting industry on Merseyside. His father, the late Wm. H. Atherton, was associated with early developments in the electric supply industry, being engineer of the Heswall Electric Light Co. from 1897 to its voluntary winding-up in 1927.

Mr. E. L. Wildy, managing director of the London Electric Wire Company and Smiths Ltd., has been appointed managing director of their subsidiary company, the Liverpool Electric Cable Co., Ltd.

The Metropolitan-Vickers Electrical Co., Ltd. announces that as from 1 Mar. **Dr C. Dannatt,** O.B.E., M.C., M.I.E.E., was appointed deputy managing director. Dr Dannatt, who has been assistant managing director since Aug. 1951, received his technical education at Armstrong College, Newcastle, and following service in the first world war went to M-V as a college apprentice in 1921. Thereafter he joined the Research Department, taking charge of the electrical and magnetic section in 1924; he became a recognised authority on electrical measurements, especially in relation to magnetism and the behaviour of dielectrics, and in 1936 he received the degree of Doctor of Science from Durham University. In Aug. 1940, Dr Dannatt was appointed to the Chair of Electrical Engineering in the University of Birmingham, but at the request of the Admiralty he continued part-time activities with the Metropolitan-Vickers Co. He returned to that company in 1944, becoming deputy chief electrical engineer in 1945. Two years later he was appointed chief electrical engineer and joined the board of the company, and in 1951 he became assistant managing director and director of research and education, retaining the latter appointment until July last year.

From the Metropolitan-Vickers Electrical Co., Ltd., we also hear that as from 1 Mar. **Mr J. F. Perry,** A.M.I.E.E., managing director of Metropolitan-Vickers Electrical Export Co., Ltd. was appointed a director of the parent company. Mr Perry joined the Company in 1913, and after the first world war he rendered valuable service as a member of the French Reconstruction Committee in replanning the devastated collieries in the north of France. Since then he has travelled extensively in Australia, Africa and Europe in connection with M-V mining interests. From 1935 to 1945 Mr Perry was sales manager, Plant Department. He was appointed general manager of Metropolitan-Vickers Electrical Export Co., Ltd., of which he was already a director, in 1945, and he became managing director of the Export Company at the end of 1948. In August of that year he was made a Comendador da Ordem Militar de Christo, receiving this honour from the President of Portugal in recognition of engineering service rendered to the Portuguese Government in connection with hydro-electric schemes.

Following the meeting of the Council of the Electrical Development Association on Tuesday last, it was announced by the chairman, Dame Caroline Haslett, that the Association had conferred the title of director and secretary on **Mr V. W. Dale,** the Association's general manager and secretary.

Mr E. W. Steele

Mr P. H. Scrine

Mr H. Atherton

Dr. C. Dannant

Mr. J. F. Perry

Councillor C. Wilman, an electrical engineer and contractor at Heckmondwike, has accepted an invitation to become the next mayor of Batley.

Manager of the Radio and Television Department of the General Electric Co., Ltd., **Mr M. M. Macqueen,** is sailing for the U.S.A. in the *Queen Elizabeth* on Saturday next, 13 Mar. He expects to stay about a month in America, examining new developments there, including colour television.

The appointment of **Mr A. H. Young,** M.I.E.E., as a director of Aron Electricity Meter Ltd., to which we briefly referred last week, is to fill the vacancy caused by the resignation of **Mr A. N. Rye,** M.I.E.E., who, after 17 years' service as a director of the company, wishes at his age to reduce his business responsibilities. Mr Young is managing director of Edmundsons Electric Co., Ltd., and a director of the companies in the Edmundsons Group. For many years he was closely identified with development in the electricity supply industry as commercial manager of Edmundsons Electricity Corporation Ltd. and a director of thirteen companies in the group. He was chairman of the Utilization Section of the I.E.E. in 1951/52.

Sir Arnold Gridley, K.B.E., M.I.E.E., M.P., chairman and joint managing director of Mawdsleys Ltd., chairman of Southern Areas Electric Corporation Ltd. and a director of a number of other electrical concerns, who was taken ill in the House of Commons about three weeks' ago, has made extremely good progress in Westminster Hospital we are pleased to hear. He expects to leave hospital very shortly.

Mr W. D'Arcy Madden, chairman and managing director of Hick, Hargreaves and Co., Ltd., was last week presented with a radiogram, television set and an illuminated address by members of the Bolton and District Engineering Employers' Association, on his retirement after twenty years as their president.

OBITUARY

Mr A. V. Sendell, a sub-area publicity officer at Bristol with the South Western Electricity Board since 1950, died on 25 Feb. He had earlier been associated with the Bath electricity undertaking for about 46 years. He was chairman of the West of England section of the Electrical Power Engineers' Association and a member of the N.J.B. and the District Joint Board for the Electricity Supply Industry. He was president of the E.P.E.A. in 1930.

Mr S. Howarth, formerly of the North Western Electricity Board, whom, as we noted last week, was to have joined the Simplex Electric Co., Ltd., on 1 Mar. as Creda sales engineer for the North West, was killed in a road accident on 26 Feb.

Mr H. Hamberg, a director of the Skefko Ball Bearing Co., died recently.

Alderman F. J. Cowie, senior partner of the Caledonian Engineering Co., electrical contractors and general engineers, of Bradford, died on 27 Feb., aged 70.

Dr John McCombe, PH.D., M.I.E.E., senior transmission engineer with the Yorkshire Electricity Board, was found drowned in Waterloo Lake, Roundhay Park Leeds, on 3 Mar. Dr McCombe, who was a recognised authority on overhead line practice, was a frequent contributor on that subject to THE ELECTRICAL TIMES, and author of a well-known book. A native of Lethanhill, Ayrshire, he studied at the Royal Technical College, Glasgow, and Glasgow University. Prior to joining the Yorkshire Electricity Board, he was with the Yorkshire Electric Power Co. as transmission engineer. He was a part-time lecturer in electrical engineering at Leeds College of Technology and was a member of many committees dealing with the design and standardisation of overhead lines. Recently he had not been in good health, and had been on sick leave.

Mr J. K. Brydges, M.I.E.E., who retired from the position of borough electrical engineer of Eastbourne in 1939, died on 7 Mar., aged 86. Educated at Cheltenham College and at King's College, London, he started in the electrical profession in the U.S.A., being in charge of undertakings at Andover and Weymouth, Mass., and later at Augusta, Georgia, before returning to England in 1897 as city electrical engineer at Wakefield. In November, 1899 he received the appointment of borough electrical engineer at Eastbourne on the occasion of the Corporation purchasing the undertaking from the Eastbourne Electric Light Co. Mr Brydges was president of the I.M.E.A. in 1930 and of the Association of Municipal Electrical Engineers in 1931. He will be remembered for his domestic electrification work—he also adopted a progressive policy in regard to electric street lighting.

Mr A. E. Darlington, who served with the British Thomson-Houston Co. for 43 years, died recently, aged 68. For a time he served in the Lamp depot in Liverpool, and in 1950 resigned from the post of manager, Lamp and Lighting Sales, owing to ill health.

BRITISH STANDARDS

Arc Welding Plant and Equipment. *B.S.638:1954. Price 7s. 6d. net.* This standard, incorporating B.S.1071 which deals with a.c. arc welding plant and equipment for heavy constructional work, brings up-to-date the two previous standards (1935 and 1941). It introduces the concept of arcing time factor to permit better utilisation within thermal limits of the welding plant, and also specifies a Group X plant which under certain circumstances can give outputs in excess of the rated maximum continuous hand welding current. Both d.c. and a.c. equipment are dealt with and requirements are given for flexible cables, electrode holders, return current clamps, plugs and sockets and other accessories. Recommendations are also included on the installation and use of multiple-arc transformer welding equipment for shipyard and other heavy constructional work, and also on power factor correction and the use of reactors.

Graphical Symbols for telecommunications: Additional symbols for electronic tubes and valves, including gas switches. *Supplement No. 3 (1953) to B.S. 530:1948, Price 2s. 6d.* As the current edition of B.S.530 does not include many of the symbols used in v.h.f. techniques, and gas filled cold-cathode discharge tubes, this supplement has been published to cover these devices. It gives symbols for various electronic tubes and gas switches used particularly in radar work, those for gas switches being a logical development of symbols given in Supplement No. 2. Symbols for gas filled, cold-cathode discharge tubes are based on current British and American practice. Small amendments to existing symbols in B.S.530 are necessary to meet developments, and these are given.

Dimensions of three-phase electric motors. *B.S. 2803:1954. Price 2s. 6d.* Standard dimensions necessary to ensure that motors of different make will be mechanically interchangeable for all normal applications to the given machine are set out here. Except for the 1 h.p. 4-pole motor, the dimensions given are similar to the appropriate American N.E.M.A. standard, but h.p. ratings have been increased to accord with practice in this country, and shaft dimensions have been increased accordingly. The specification applies to foot-mounted squirrel cage induction machines of the totally enclosed fan-cooled type.

Studio spotlights. *B.S. 2063:1953. Price 2s. 6d. net.* Prepared at the request of the British Film Producers' Association, this new standard relates to three sizes of spotlight, using 500, 2,000 and 5.000 W filament lamps, respectively. Originally, it had been hoped to specify, quantitatively, optical performance together with general dimensions and construction of spotlights. However, results of tests showed that the desired specifications could not be incorporated whilst a reasonably uniformity in performance could be achieved equally well by controlling the essential dimensions of the optical system. The standard, therefore, specifies only essential features in the construction of optical system and lamphouse, prescribing lens and diameters and focal lengths.

British Standards reviewed above may be obtained from the Sales Branch of the British Standards Institution, 2 Park St, London, W.1, at the prices stated.

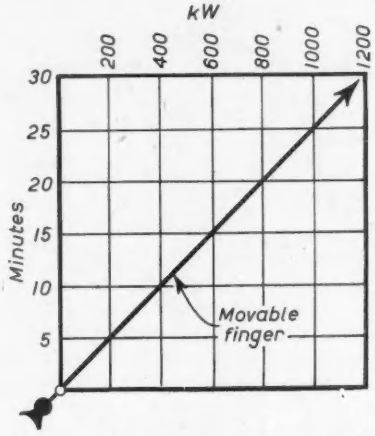
PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Abnormal Factory Load

DURING the recent spell of severe weather, heavy loads on the works substation, at certain periods morning and afternoon, made it necessary to cut certain items of plant that would not affect production to limit an otherwise abnormal maximum demand. The m.d.i. was in the substation and to apply the cuts direct from there was the ideal, as this could be done within seconds of the abnormal demand being assessed. The substation had to have attendance during the daily peak periods, and to assist the attendant in making a rapid estimate of the probable half hourly demand, a chart with a movable finger was prepared and fixed close to the m.d.i. By reading each five minutes the kW and the time elapsed on the timing disc, and moving the chart finger to to cut these values, the finger points along the top line to the probable m.d. for the half hour. The allowable maximum was 1,200 kW, so that if at any instant the finger touched, or closely approached this, a cut would be applied in three stages, depending upon the effect of each.



The chart with movable finger used to indicate maximum demand rapidly

Three c.b.s were selected for these cuts, as they offered the least interference with production whilst giving the load relief required, either singly or in the worst cast together. The first cut was to be made to the c.b. supplying a pump feeding water to a storage tank, from which it was automatically controlled between "high" and "low" levels, the latter having a reserve of water sufficient for a 45-minutes supply, which meant the pump was capable of being stopped some portion of each peak period. The second cut was to be a switch controlling about 75 kW of stores space heating, which would not affect the comfort of the staff, whilst the third and final cut was the supply to an auto-controlled air compressor motor, one of three similar situated in separate parts of the works and connected to common air reservoirs and pipe lines.

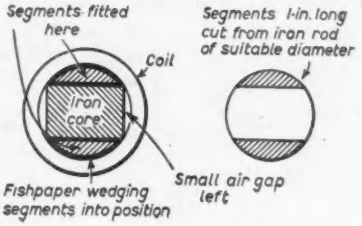
It was considered that with a pipe line pressure of 75 lb/sq in. the cutting of one compressor motor for short periods could be tolerated, but that below this pressure no cut should be made. It became necessary therefore to bring some indication of air pressure to the substation and this was accomplished by fixing a pressure gauge, into which a micro-switch was fitted to operate just below 75 lb/sq in., into the nearest pipe line to the substation. From this gauge a twin bell wire was carried to a red warning lamp and 24 V transformer located adjacent to the air compressor c.b.

The afternoon peaks were levelled off usually by the first two cuts, but on several occasions during the early morning when heating, lighting and power demands were greatest, the third cut was imposed, but on each occasion the warning lamp was out, indicating a satisfactory air pressure, and in fact the cut usually of about ten minutes never caused the air pressure to drop below the limit which had been set.—*T. H. Snelson.*

A Core in a hurry

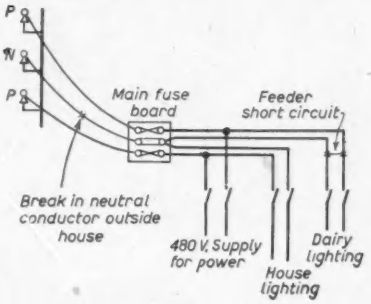
A COIL burnt out on a crane and we were given one hour to repair it. We had a coil of correct turns but it had a circular bore while the iron core was rectangular. This naturally left a large air gap and as the amp turns required to send flux across an air gap is given by 0·8 × [Length of air gap] × [density in air gap] it didn't look too good for our coil. With fixed number of turns it meant increased load to find the necessary amp turns. Two segments from a circular bar were cut and wedged in with thin fish paper as shown in the sketch and this arrangement has been in operation since it was fitted. We now have a correct coil but we are waiting to see how long the makeshift lasts. The whole repair took 50 minutes.—*D. F. Weeden.*

Method of using segments cut from an iron bar to increase the iron in a coil core


Segments fitted here
Coil
Iron core
Segments 1-in. long cut from iron rod of suitable diameter
Small air gap left
Fishpaper wedging segments into position

Open Neutral

THE other day I was called out to deal with a fault on a farm, the complaint being that the lamps in the house were over-bright and burning out. On investigating I found the unusual state of affairs of 480 V between line and neutral instead of the customary 250 V. The farm itself was supplied by two outers and mid-wire—of a two phase, three wire supply of 480/250 V.



Main supply circuit and control for the farm, showing position of both faults

The dairy was fed by the 250 V phase and neutral supply of opposite polarity to that of the house. On testing, the feed was found to be short-circuited but, oddly enough, the fuses protecting this part of the installation were still intact. At first sight, the conditions appeared misleading but further thought indicated the cause of the trouble—an open-circuit in the neutral wire to the farm. With the solid link in the neutral, the short-circuit would cause its potential to rise to that of the line feeding the dairy and hence give 480 V in the house.

On examining the main supply outside the house I found a broken tapping wire on the neutral. Probably due to swaying caused by the wind this conducting had been wearing through down to the last strand and was quite possibly almost broken when the short-circuit developed. The fuses being thus stronger than this weak point, the remaining connection must have burnt through thus setting up the conditions found on arrival. After repairs were carried out the installation was tested and found correct.—*G. A. L.*

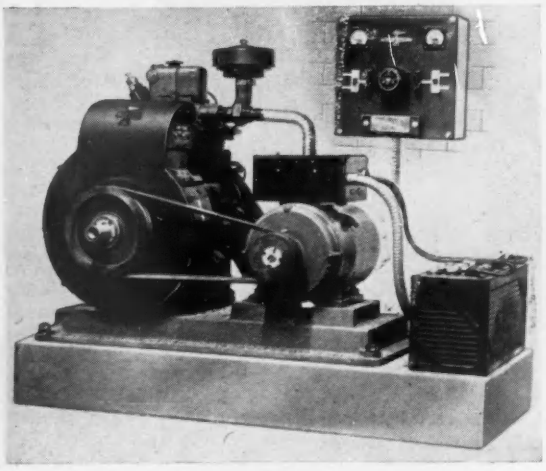
Equipment for Industry

Diesel Driven Lighting Plant

WHERE a mains supply, as in several rural areas, is not available, engine driven generating plant makes a useful alternative for the consumer anxious to make use of the advantages of electricity. For the low power consumer, whose requirements cover little more than lighting, WORKMAN, REED and Co., Beacon Works, Hewish, Bristol, are now manufacturing an a.c. lighting plant, driven by a small diesel engine.

Having outputs of 1,000 and 1,250 watts, single-phase 50 c/s at 230 V, these two ranges utilise as prime mover to Petter type PAZ1, single cylinder air-cooled diesel engine. This power unit develops 1·5 b.h.p. at 1,000 r.p.m. and 2·5 b.h.p. at 1,500 r.p.m. A heavy flywheel is designed to ensure smooth running whilst heavy vee-belt drive to the generator is employed. Five alternative methods of starting are available, including automatic and mains failure control. Built in accordance with relevant British Standards, the alternator is the self-regulating, self-exciting type, incorporating battery charging and electric starting windings.

Protection is provided by fusing and overload circuit-breaker, whilst a thermal trip is fitted to operate should the fuel supply fail. Of the automatic, enclosed, wall mounting type, the switchboard is supplied complete with output ammeter, charging ammeter, O/L c.b. and fuses, hand/auto control switch, high/low battery charging switch. Equipment with the unit also includes a 15 gallon fuel tank (sufficient for 90 hours running at full load), 18 volt starter battery, ancillary tools and operating instructions.



Workman, Reed's new "Beacon" 1 kW lighting plant utilising diesel drive

Portable Lamp Range

DESIGNED to withstand the wear and tear to which portable lamps are subject, a new range of these units produced by OLDHAM AND SON, LTD., Denton, Manchester, includes types suitable for a variety of different locations. One of the new series is the "Tanka II," suitable for use in oil refineries, chemical works and similar hazardous areas. Approved by H.M. Inspector of Factories for use in most situations where inflammable gases are met, and also by the Ministry of Fuel and Power for use in mines, the unit is made secure by a magnetic lock over the charging contacts and sealed locks on lens ring and top cover. Its secondary cell e.m.f. source is stated to energise the one amp Krypton filled lamp satisfactorily for eight hours.

A portable, unspillable lamp, the Shunters' lamp is another unit in the new range which has the approval of the Ministry of Fuel and Power for use in mines. Giving either white, red or green light, this lamp is suitable for visual signalling purposes for various types of traffic or shunting control. Two sizes of "Tuba" safety torches are also included in the series, together with cap lamps for mining and industrial use.

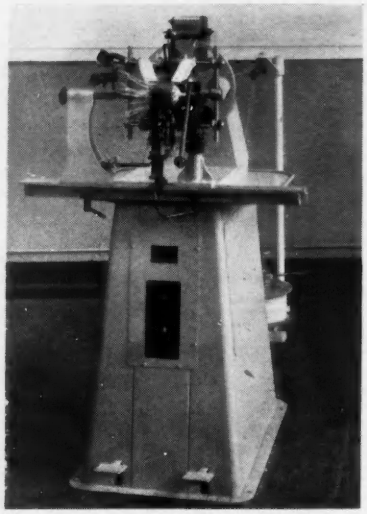
Measuring Capacitance and Resistance

ONE of the products of a recently-formed company, GRAYSHAW INSTRUMENTS, 54 Overstone Rd, Harpenden, Herts, is their CR50 bridge, designed for measuring resistance from 1 ohm to 10 megohm and capacitance from 10 picofarad to 100 microfarad. Having a clearly calibrated linear scale, the bridge accomplishes measurements in 14 ranges, the effective scale length thus being 120 in. Internal standards used in the instrument are stated to be accurate to within 1%.

In operation, an approximate value of the component under measurement is selected by means of the range switch, the final balance effected by rotation of the main dial pointer. Indication of balance is given by an electron beam null indicator.

Heavy Duty Winding Machine

HAVING many features similar to their smaller machine, a heavy duty Model No. 3 "Quickway" armature winding machine is now being produced by the MIDLAND DYNAMO CO., LTD., 64 Belgrave Gate, Leicester. The new machine is designed to wind conductors between 24 and 16 s.w.g. into slots of two pole armatures up to 6 in. diameter and 6 in. core length. From a de-reeling stand at the rear, wire is fed through a hollow driving shaft to the winding member, which in turn carries it around the stationary armature. For commutator lead connections a looping attachment is provided, whilst a foot operated index mechanism rotates the armature from one slot to the next to facilitate rapid indexing. One lever locks and releases the winding guides, the armature being held between a centre at one end, and a toggle clamp at the other which is released for indexing or removing the armature. Floor mounted, the unit is powered by a variable speed single phase to give a maximum winding speed of 100 turns/min., foot-operated controls leaving the operator's hands free.



The neat appearance of Midland Dynamo Co.'s Model 3 armature winder is well shown here. Note the foot operated control

"Frontier 40-E"

RESULTING from negotiations with the American patent holding company, DARALUM CASTINGS LTD., Longfield Rd, Darlington, announced recently that the new high-strength aluminium alloy "Frontier 40-E" is now available for production castings in this country. The major constituents of this alloy are zinc, 4·75 to 5·75%; magnesium, 0·4 to 0·6%; chromium 0·4 to 0·6%; and titanium 0·15 to 0·25%. One of its prominent features is the property of age hardening at room temperatures giving routine mechanical properties of a yield point of 13 tons/sq in.; ultimate tensile stress of 16 tons/sq in., an elongation of 5% and a 75 Brinell (500/10).

A New 12 in. Mazda Fitting

JUST brought out by BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, is a new inexpensive moulded plastic fitting to use with the 12 in. 35 W architectural tube lamp.

The fitting is easily installed by means of two wood screws, the heads of which are concealed from view when the lamp

The new fitting seen with its packaging

is in place. Clip sockets in the fittings grip the side-mounted pegs on the lamp. The fitting is supplied either in cream or pastel green, priced 8s. 11d. including purchase tax. It is also available complete with lamp and wood screws in an orange, black and white carton.

New English Electric Refrigerators

TWO new refrigerator models have been announced by ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2, as mentioned last week.

These are the new EA83 refrigerator and the EA34 model. The first is an 8·3 cu ft model with 14½ sq ft shelf area.

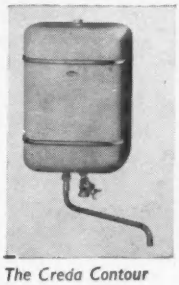
Amongst new features of this new model are a full width freezer with drop down self-closing insulated plastic door and containing two anodised aluminium trays fitted with quick-release separators, a 3 pt dessert tray and ample room for frozen foods and ice cream; a cold-drawer also running across the cabinet and situated under the freezer which, made of plastic and ridged on the floor, gives complete cold air circulation round fish and meat in store; and egg racks and shelves fitted in the full-length door. These shelves are in mazarine blue plastic; the top shelf having a detachable aluminium egg rack.

An attractive chromium-plated door-handle is backed by a blue plastic mask to protect the enamel from finger marks. Inside the cabinet two roomy white polystyrene Humi-drawers for fresh fruit and vegetables move on detachable runners. Overall dimensions are 57⅜ in. by 28¼ in. wide by 27⅛ in. deep. The exterior is finished in white or cream stove enamel, rod shelves are enamel covered and edged in chromium, storage doors and shelves are of white or blue polystyrene and the price 132 guineas tax paid.

The smaller EA34 is 3·4 cu ft capacity with 6·4 sq ft of shelf area, is designed for the smaller kitchen and is a similar if less comprehensive model. Again it is available in cream or white. Door hinges, latch and strip trim are chromium plated whilst freezer door and storage tray are turquoise and the price of this model is 63 guineas (tax paid). A photograph of this model appeared in our last issue.

The Creda "Contour" Water Heater

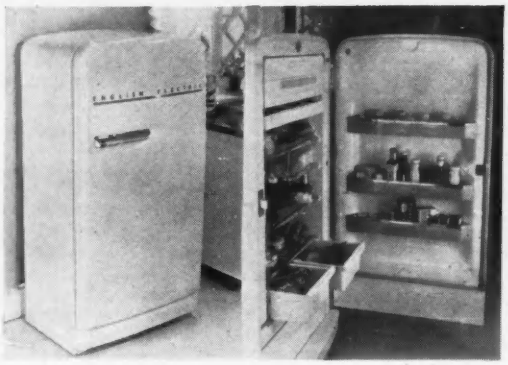
A NEWCOMER to the range of "Creda" waterheating equipment supplied by SIMPLEX ELECTRIC LTD., Broadwell, Oldbury, Birmingham, is the "Contour" storage type heater.



The Creda Contour

Available in two sizes, 1½ gallons and 2½ gallons, these heaters are for wall mounting. Made of heavy gauge copper brazed at the seams and tinned inside and outside by immersion the container has been tested to B.S.S. recommendations of 10 lb per sq in. A good quality heavy sheet enamelled casing finished in white, cream, pastel blue or green covers the thermal insulation of granulated cork.

The heating elements are withdrawable from their sheaths without emptying the heater, these sheaths being mounted in apparatus plates easily withdrawn by removing the nuts securing them to the inner container. The elements are controlled by thermostats.



This is the 8·3 cu ft model just introduced by English Electric. The three shelves in the door provide useful extra storage space

For the Electrical Trade

Difulite a New Ceiling Medium

NOW marketed by METAL SECTIONS LTD., Oldbury, Birmingham, is a new type of metal louvre ceiling.

Available in the form of panels made from 2 in. wide by ·01 in. aluminium alloy, fabricated and painted in off-white, supplied up to a maximum of 7 ft by 2 ft 6 in., the ceiling affords great flexibility in the design of interiors. It is especially suitable for inexpensive reconstruction work where unsightly roof structures are to be concealed together with the pipes of the various services. Incidentally the efficiency of water sprinkler systems is in no way impaired by being concealed by these panels.

An immediate advantage apparent to the engineer and the architect is the possibility of installing fluorescent and other lighting behind this "false" ceiling, thus providing glare-free but otherwise unrestricted lighting in a room.

Weighing 4 oz per square foot and easily installed these panels are priced 5s. per square foot for values under 100 sq ft reduced to 4s. per square foot for orders over 100 sq ft up to 1,000 sq ft.

These panels can also be supplied sprayed in either two or four colours to give an attractive polychromatic effect when viewed at differing angles.

Price Changes

BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2, announce that as from 3 Mar. the price of their Mazda 75 W reflector spotlight is reduced from 9s. 5d. including tax to 8s. 4d. including tax.

ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2, announce that similarly the price of the Model 2011 automatic cooker is now listed at £58.

Erratum

In the caption to the illustration on page 317 in our last issue we referred to Fig. 3 as the Ada Coronation Washer. We regret that this is in error, the illustration showing the Burco Model 10P Washing Machine.

NEWS OF THE WEEK

Govt. investigating East-West Trade

INCREASE IN EXPORTS TO IRON CURTAIN COUNTRIES PROBABLE

DISCUSSIONS are to take place shortly among countries on this side of the Iron Curtain with a view to extending trade between Russia and the West. Following statements in the House of Commons in the past few weeks by the Prime Minister and the Minister of State, Board of Trade, the Government are understood to be seeking relaxations in the "list" of strategic goods which may not be exported to the Soviet bloc. There is in fact no published list of strategic goods so far as Russia is concerned, each application to export being considered individually. This procedure differs from that in force for China, where control is much more severe, and bans such items as rubber and machine tools, not excluded from Eastern Europe. American reaction to the Prime Minister's assertion that the U.K. was eager for more trade, is understood to have been tested and found not unfavourable. Proposals for relaxations have been submitted to the Consultative Committee sitting in Paris, who advise on and review such matters for the European powers. In the meantime trade and financial negotiations are being, or will be, held with Poland, Hungary and Czechoslovakia.

Delegates on the recent Moscow trip have recently met the East-West Trade Committee of Conservative M.P.s. Matters discussed included the embargo list and quantative controls, we are informed. A further meeting is to take place shortly with Labour M.P.s.

There is also further news of the trade mission itself. A Reuter report from Moscow states that Mr W. R. Hall, of Aberdare Cables Ltd., has signed a contract for a "substantial quantity" of h.t. cable. Value of the order is not known. Mr Sydney A. Lane, director of the Brush Group, has just returned, and has secured contracts worth £3¼ million. They involve the supply of diesel generating sets, turbines, transformers and switchgear. Orders worth another £3 million were secured by Mr Lane last year, it will be recalled. The Brush Group has in fact been particularly active in the Russian market since the war. Total value of orders obtained between 1946 and the present time amounts to some £18¼ million.

Electricity Saving Stamps from Slot Machines?

SALES of stamps in the N. Western Board's Area to help consumers pay their quarterly accounts increase in popularity week by week, and although the system has proved most successful, new methods of extending the service are constantly being suggested. Latest proposal involves the possibility of using slot machines in service centres, and this is now being considered by the Board, we understand. At their recent meeting, the Consultative Council again urged that the scheme be extended, and asked that their previous suggestion that stamps be made available at sub post offices be re-examined.

The Board, for their part, are also anxious to widen the system but consider that control would be difficult and the possibility of forgery increased if the stamps were sold at post offices or contractors' shops.

These stamps are valued at 2s. 6d. and may be bought at any time by consumers who can use them to pay their bills. Since their introduction over 800,000 (valued at £100,000) have been sold.

SECRET TALKS TO END ELECTRICIANS' STRIKE?

NEGOTIATIONS, described as "delicate," were taking place earlier this week in an effort to end the strike of electricians which has affected the contracting industry for the past nine weeks. Conciliation officers of the Ministry of Labour were acting as intermediaries between the National Federated Electrical Association and the Electrical Trades Union, we understand. In the past few weeks the Union has called out on strike electricians employed by specific contracting firms operating in various parts of the country. Most of these men are on strike for an indefinite period. A few wiremen employed on preparatory work for the British Industries Fair were called out this week. Mr E. J. Haynes, an area official of the E.T.U., has said that no work would be done at the Fair unless there was an agreement on the present wage claim. But if there was no national agreement individual firms would be permitted to work if they agreed to pay the extra 3d. an hour to all their electricians.

New Tenants should have Wiring Tested

IT HAS been suggested that when a house changes hands a label should be attached to the electricity meter recommending that the wiring be tested by the new occupant for safety. The proposal has been backed by the Blackburn Committee of N.W. Electricity Consultative Council. Ald. F. Kenyon stated that the Board was not opposed to the idea, in fact they were willing to provide the service, although if there should be a heavy demand, the Board would not have the staff to cope.

Ald Kenyon also referred to the question of fixing meters outdoors. It had been decided at both national and local level that such a system had more disadvantages than advantages, nevertheless he still thought that outdoor meters were worth investigation, and he was carefully watching one experiment on these lines, he said.

U.K. Manufacturers' Prospects in West Africa

PORTUGUESE West Africa does not strike one immediately as a good market for British goods, and yet there are distinct possibilities both for heavy machinery and for consumer goods, although the latter is dependant on the first and may not be really remunerative for some time. Such is the impression gained from the B.o.T.'s Economic Survey.

Shortage of power has long been a problem in Angola and it has been the objective to develop the abundant hydro-electric potential of the country. Two major schemes have been started and the Mabubas project to supply power to Luanda is expected to be completed by the end of this year. Extension of the Mabubas scheme, completion of the Biopio scheme, and the Mabala project are included in the Development Plan, 1953-58. In all these projects there is of course the possibility of trade. The bottleneck of electric power production is expected to be broken shortly in the north and manufacturers will be able to install electrical machinery. Similarly as development spreads, the market for more luxurious goods and domestic appliances should increase. Principal electrical items listed where business may be done are electrical fittings and accessories, refrigerators, generators, motors and transformers.

Intending U.K. exporters should remember that it is not easy to export goods conflicting with either local or Portuguese manufacture.

S.E. Scotland Concerned about Rural Supplies

LACK of amenities, particularly in electricity, is threatening to close down a number of rural schools in the S.E. Scotland Electricity Board's area. Such conditions have made it very difficult to find teachers to fill vacant posts in these outlying schools. In consequence the Electricity Consultative Council, at their Edinburgh meeting last week, added their support to the claim for priority for these schools. The Council had before them a letter from Berwickshire's director of education who cited two specific instances where head teachers had resigned and no one would fill the post. At both schools distribution lines passed within 200 yards and the nearest transformer was at a farm half a mile away. Education Authorities were anxious to keep these and other schools open to keep the population in rural areas, but if teachers could not be found, the schools would have to be closed. High priority was therefore sought for the supply of electricity to these schools, and the Council agreed to forward the appeal to the Board.

Still on the same subject of supplies to rural areas, concern was expressed at the inadequacy of the £167,000 capital allocation. This sum would provide for only two of nine development schemes, it was pointed out. Mr J. Rutherford said there should be a further allocation of capital to allow expansion of supplies to parts of Northumberland supplied by the Scottish Board. The board also supplied Berwick and as the N. Eastern Board were able to supply electricity to outlying farms within 12 months, compared with a matter of years by the S.E. Scotland Board, it might well be that they would lose that area to the English body with consequent loss of income. Representations are to be made on the subject.

Board Conferences at Croydon and Dorking

A CONFERENCE of domestic science teachers from all principal schools in the Croydon and W. Kent sub-area of the S.E. Electricity Board took place at Croydon recently. The object was to encourage the greater use of electrical equipment installed by the Board in schools for instructional purposes and tell them something of current developments. About 50 teachers attended. Programme included a talk by Mr J. A. Stedman, a demonstration by Miss Marguerite Patten of the B.B.C., of French cooking, a demonstration of cold cooking by Miss L. E. Barnes, and an inspection of equipment in the showrooms.

A very successful three-day conference and exhibition on Electricity in New Houses was staged by the Board at Dorking last month. It was attended by representatives of over 50 local authorities, as well as architects and builders. An exhibition showed how wiring and installation costs might be reduced.

COOKER DEMONSTRATIONS

SPECIAL series of demonstrations promoting the use of electric cookers was launched by the S.E. Scotland Electricity Board last week. During the next two weeks daily demonstrations will be given at their George St showrooms in Edinburgh, using a number of the most up-to-date appliances. These include the English Electric 2011, Revo Monarch, Tricity Queen, Creda Comet, Jackson 290 and Falco Royal.

Permanent Display

WE learn that Siemens Electric Lamps and Supplies Ltd. now occupy a permanent stand at the Building Centre in Store St, London. It is on the second floor in the architects', designers' and contractors' section. All types of the company's products are displayed, including lamps and fittings, switchgear, telephone apparatus and street lighting equipment.

New Tender Refused

AN electrical firm has been refused permission to submit a second tender after an error had occurred in their first quotation. The tenders concerned street lighting in Hanley and Burslem. Stoke City Council, we understand, received a letter from Revo Electric Co., Ltd., whose tender was accepted stating that an error had been made and asking to submit an amended tender. The Highways Committee recommended that the request be refused and the tender of Metropolitan Vickers Electrical Co., Ltd., for £2,277 be accepted, subject to normal formalities.

OFFICIAL PUBLICATIONS

AUTOMATIC TELEPHONE EXCHANGES. Maintenance of. Report of Anglo-American Council of Productivity. Price 5s. 6d.

BRITISH STANDARDS. B.S. 1673, Part 2, 1954: Testing Raw Rubber and Unvulcanised Compounded Rubber, Part 2, Methods of Chemical Analysis; B.S. 638, 1954: Arc Welding Plant Equipment.

MONOPOLIES AND RESTRICTIVE PRACTICES. Annual Report of B.o.T. for 1953 (see page 382). H.M.S.O. 6d.

Reorganisation of Codes of Practice

CODES of Practice as they affect the building and engineering industries will be dealt with by the British Standards Institution as from 1 Apr., 1954. The B.S.I. is to establish a Council for Codes of Practice for this purpose, and under this will be set up committees covering civil engineering; building construction and engineering services; mechanical engineering; and electrical engineering. Up to the present, of course, codes have been prepared by a Council formed under the aegis of the Ministry of Works.

Within the British Standards Institution, the new Council will have the status of a Divisional Council. In the preparation of Codes, it will consult with all appropriate organisations, including the professional institutions. The latter have been closely connected with the formation of the new Council.

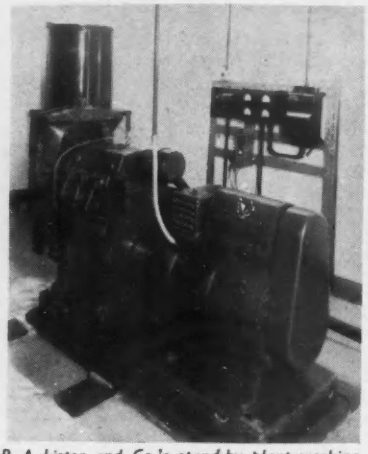
That the B.S.I. should take over the preparation as well as the publication of codes of practice was recommended by the Cunliffe Committee, which reported in 1950 on the whole question of the British Standards Institution.

ROYALTY AT IDEAL HOME EXHIBITION

The Duke and Duchess of Gloucester seen chatting to Mr V. W. Dale on E.D.A.'s stand during their visit to the Ideal Home Exhibition at Olympia. A general view of a corner of the Association's stand is on the right

Stand-by Plant for Spurs Football Ground

REFERENCES in these columns recently of R. A. Lister's successes in providing equipment for numerous civil defence control rooms, and of the supply of automatic lighting supply to football grounds, are linked by a report to hand now of that company's part in installing generator sets as stand-by plant at football grounds. Latest installation is at the White Hart Lane ground of Tottenham Hotspur F.C. where a 13·23 kW 400/230 V 3-phase 50 c/s a.c. generating plant incorporating an FR3 radiator cooled diesel engine has been fitted. Tests have shown that the stand lighting provided from the generator set is ample for spectators to find their seats and sufficient to illuminate the terraces and exits to ensure an orderly withdrawal by the crowd in the event of a failure of the public supply. This stand-by plant to work in conjunction with the main floodlighting equipment will, as mentioned last week, give a great boost to floodlit football. Lister's have also supplied similar equipment to Plymouth Argyle, Glasgow Rangers, and Wolverhampton Wanderers, the latter being the largest, comprising a FR6 set in a 27·5 kW, 400/230 V 3-phase, a.c. plant, which starts up automatically on a mains failure.



R. A. Lister and Co.'s stand-by plant working in conjunction with the main floodlighting equipment at Tottenham Hotspur's football ground, London

Students visit Works

STUDENTS from the City and Guilds (Engineering) College, S. Kensington, took advantage of an invitation to tour the Derby works of International Combustion Ltd., recently. They inspected a deal of equipment destined for the B.E.A.'s power stations, including Drakelow, which was particularly significant as earlier in the day the students had visited that station. These visits are part of the college's regular curriculum. Over 50 students were in this party.

The First Half-Century

The current number of a popular magazine asks, "What is an electrical engineer?" and in its answer implies that he is a man who goes in hourly danger of his life, and whose heroism is only paralleled in the annals of the Victoria Cross. Not that the author, Mr F. D. Godwyn exactly intended to convey this impression, any more than by his title "Slaves of the Lamp" he wished to imply that the electrical engineer is a slave; but he has collected into one article so many sensational mishaps in electricity works, that the perspective is distorted and the ordinary humdrum life of a well-conducted station is forgotten. The article is better than the usual run of such contributions to the lay press, for Mr. Godwyn is an electrical engineer himself, and does not fall into the usual technical errors. His artist is less fortunate and more imaginative.—*From our issue of 10 March, 1904.*

PROGRESS OF MONOPOLIES ACTS DURING 1953

EVERY year the Board of Trade issues a report on the operation of the Monopolies and Restricted Practices Acts. That for 1953, which was published last week, notes four new references to the Commission, none having much electrical interest. In addition, there was an extension to include the question of public interest. In addition, there was an extension to include the question of public interest of the reference on the supply and export of certain "semi-manufactures" of copper and copper-based alloys.

Referring to published reports of the Monopolies Commission, this B.o.T. paper notes that E.L.M.A. increased electric lamp prices on 10 Nov. to cover increased costs of manufacture; the Board, it is stated, is examining the justification for this increase. The original report said "We think that the Government should review prices from time to time." On the question of cables, discussions with the C.M.A. and the C.C.A. about action to be taken on the Commission's report continued throughout the year. In the House on Monday, the Minister of Supply said a statement would be made "very soon."

Amongst subjects on which suggestions and requests for investigations have been received are domestic electrical appliances and starter batteries (both on discriminatory arrangements); electric street lighting equipment (common or minimum prices); and electrical equipment for motor vehicles (monopoly).

JUBILEE BROCHURE

A NOTABLE golden jubilee celebrated recently was that of Foster Transformers Ltd., and to mark the occasion the company has published a brochure. This 24-page booklet, amply illustrated, outlines Foster's history from their foundation in 1903 and describes the range of products manufactured at their Wimbledon works.

New Cable Ship in Service Next Year

THERE will shortly be a new cable ship in service in European waters. It was announced last week by Submarine Cables Ltd., that they have acquired the s.s *Empire Frome* for conversion. We understand the ship is ideally suited for her new tasks. Conversion work is expected to take about 12 months, after which she will be renamed the c.s. *Ocean Layer* and be moored in the Thames at Greenwich close to the Telcon works. Once again the owners will be in a position to lay as well as manufacture submarine telephone and telegraph cables, and the new vessel will be available for charter to the cable operating companies and administrations to supplement existing repair services. The *Ocean Layer* is expected to be able to carry 3,750 tons of cable. She is 360 ft in length, 51 ft in the beam, 5,360 tons deadweight.

Submarine Cables Ltd., is owned jointly by Siemens Bros. and Co., Ltd., and Telegraph Construction and Maintenance Co., Ltd.

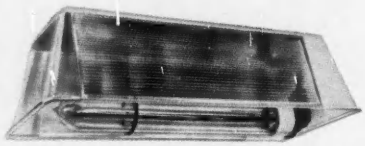
On the subject of new cable ships we hear that Cable and Wireless Ltd.'s new 3,300 tons *Recorder* is to be launched on 3 May. She has been built by Swan Hunter and Wigham Richardson Ltd.

Scrap Prices Up

RECENT increase in rail freight charges have necessitated a rise in the controlled maximum delivered prices of scrap iron and steel. An order increasing the price has been made by Minister of Supply. As from last Monday the main increases range from 2s. to 4s. 1d. per ton.

Special Lantern for Dublin's Streets

AN order for street lighting equipment for Dublin Corporation recently secured by the British Thomson-Houston Co., Ltd., involved the supply of 500 sodium open type lanterns. These were specially



B.T.H. sodium street lighting lantern made specially for Dublin Corporation

designed to meet the customer's requirements and were for use with 140 W and 85 W sodium lamps. The lanterns, one of which is reproduced above, are made almost entirely of "Perspex." To save the cost of separate boxes for auxiliary gear, provision has been made to house transformers and capacitors inside the lantern. Light control is by refractor panels with prisms machined to a high degree of accuracy and completely sealed from the atmosphere.

Research's Help to Industry Exhibited

An exhibition and conference explaining how research work is helping industry is to be held at Olympia in July. Production for Plenty will be the theme of the display, which is being sponsored by the Institution of Production Engineers and organised by the Building Trades Exhibition Ltd. Actual dates fixed are 7 to 14 July. It is intended to show how research is aiding industry by displaying improvements that have resulted from its efforts, and by helping to reduce the time-lag existing between research, development and production in many industries. Occupying prominent positions in the centre of the exhibition will be the D.S.I.R., British Standards Institution and similar bodies.

Electricity in Housing

A THREE-DAY exhibition and conference opened yesterday at the Birmingham Indoor Sports Stadium in Pershore Rd, illustrating the place of electricity in the nation's economy, especially in housing. Representatives of local authorities, hospital committees, architects, builders, electrical contractors and other interested persons have been invited to attend by the organisers, the Midlands' Electricity Board. The exhibition shows the progress made in the design of electrical equipment since the war. Displays and demonstrations deal with the latest uses of electricity for cooking, space and water heating, laundry and refrigeration, and exemplify modern methods of electrical installation in houses and public buildings, and provisions for street lighting, catering and public health. The exhibition was opened by Ald W. T. Bowen.

Louvred fluorescent fittings and Philips ceiling grid employed at Garland Ltd.'s store in Norwich

Flexible Ceiling Grid for Store Lighting

THE oft-met difficulty of varying heights in the ceiling was faced by planners of the new lighting installation in the Norwich store of Garland Ltd. This system was carried out by the store's own electrical staff in consultation with Philips Electrical's design service, which company also supplied the fittings and lamps. The problem of heights was solved by the use of instant self-start Alfriston fittings, some being mounted directly on the ceiling and others suspended by chains. These fittings were installed with louvre screens, and the special perforated metal side pieces which can be seen in the accompanying illustration, were designed and added by the store.

A feature of this installation is the flexible ceiling grid developed by Philips with store lighting particularly in mind. It allows alternative positioning of both displays and the source of illumination. The haberdashery department was found particularly suitable for this treatment and a most pleasing effect was obtained.

Local Firm Acknowledged

AT first glance the decision of Hastings Corporation to include L.P.S. cables in specifications for use in council houses, appears to have little significance. It may be recalled that L.P.S. Electrical Co., Ltd., quite recently established themselves in the town, and hitherto the council's specifications have only included C.M.A. cable. The Borough Engineer and Surveyor recently reported there had been some correspondence with L.P.S. regarding the use of the company's cable. Representatives of the S.E. Electricity Board subsequently visited the factory and as a result orders have been placed. The Board added that L.P.S. cable complies with B.S.S. requirements.

WOMAN'S PART IN ELECTRICAL INDUSTRY

THE activities of women in the electrical industries of Britain and Sweden were compared by Dame Caroline Haslett in a talk at the annual meeting of the Manchester branch of E.A.W. held recently. She said this country was far ahead of Sweden and of the U.S. in the opportunities offered to women in the electrical world. British women could participate in the technical field as well as on the policy side. There were women members of a number of Boards, she said, but in Sweden, apart from a few secondary positions, women were almost unknown in electricity.

In November the E.A.W. celebrates its 30th birthday and we understand Sir Lawrence Bray has been invited to speak of the contribution to the industry by women since 1924.

Another E.A.W. Branch

INAUGURAL meeting of the Bolton branch of the E.A.W. took place at the end of last month. Chairman of the new body is Miss E. Mitchell, and Miss M. Wilson is hon. secretary. Speakers included Dame Caroline Haslett, Mr E. G. Wardle, N.W. Board's sub-area manager, and the deputy mayor, Ald J. Vickers.

NEWS IN BRIEF

S. Wales Electricity Board is to make no charge for electricity consumed at the Eisteddfod. Sole charge will be labour costs for fixing a supply line and other necessary equipment

Fourth annual conference of the Ergonomics Research Society will take place at Ashorne Hill, nr. Leamington Spa, between 5 and 8 Apr.

Council of Industrial Design Scottish Committee is holding its third major event—a Scottish Design Congress—on 26 and 27 May.

Yorkshire Electricity Board estimate a surplus of £44,000 in accounts for 1953-54, it is reported.

Changes in import duties on plastic and rubber insulated cables, fans and conduits were announced by the Indian Finance Minister in his budget speech.

Tower wagon belonging to the public lighting section of Coventry city engineer's department has been equipped with a v.h.f. transmitter/receiver developed by the G.E.C.

Electrical and mechanical engineering staff of the architect's department of the L.C.C. is to be transferred to the chief engineer's department. They are responsible for the examination of installations in cinemas, theatres, etc.

As from 31 May the Government Broker for copper will cease to operate. Conditions are such now that his services are unnecessary.

First of 14 new diesel-electric locomotives for the Commonwealth Railways of Australia had a trial run between Banbury and Birmingham recently. Being built by Birmingham Railway Carriage and Wagon Co., Ltd., Crompton Parkinson Ltd. are responsible for the electrical side.

North East Electrical Club held their first Ladies' Night at the Royal Turk's Head Hotel, Newcastle, recently.

Industrial division of Philips Electrical Ltd. showed their new film, "A New Approach to Production Improvement" for the first time last week. It depicts the many ways in which the company assists industry and the story revolves around Philips' Application Centre, constantly at the service of industrialists to give advice and assistance. Copies of the film are available for loan on application.

ELECTRIC SUPPLY NEWS

Belfast

THE corporation last week rejected by 23 votes to 9 a motion requesting the Government to hold a sworn inquiry into the circumstances which had caused delay in the placing of certain contracts for the new West power station. The motion was put forward by Alderman M'Kee. Sir William Neill said that when they previously sought a sworn inquiry into the administration of the Electricity Department the Minister asked for specific points. The General Purposes Committee found it difficult to meet that request and nothing further was done. He thought Alderman M'Kee knew the causes of the delay.

A few days earlier, the Corporation Electricity Committee considered a report by the city electrical engineer. It was agreed to take no decision on the recommendation of the engineer, that consideration of the appointment of a deputy city electrical engineer be deferred to allow more time to test the efficiency of a new two-tier system of management now in operation in the department. In his report, the city electrical engineer states that the two-tier system, eliminating the deputy manager, is held by some to be more simple, direct and speedy and to create a closer relationship between the manager and departmental heads. He recommended that the salaries of the six heads of departments be increased by £150 each to reward them for their extra duties. The Committee adopted proposals in the engineer's report for the abolition of certain posts, the creation of additional established posts and revised salaries and allowances for several posts.

Bolton

AT its meeting last week, the town council decided to object to the B.E.A.'s proposal to erect the 275 kV grid line north of Bolton. It was said that the line would pass through areas of the town which the development plan provides should be retained as open spaces, and which are of the highest amenity value for the inhabitants of Bolton.

Cornwall

AT the recent County Council meeting, Lady Carew-Pole, chairman of the Regional Electricity Consultative Committee objected to what she described as a "blanket" resolution of the County Planning Committee. This resolution supported in principle the view that electricity lines be placed underground on all future housing estates, and proposed that (a) the clerk should inform the B.E.A. that, wherever possible, regard should be had to that principle. Lady Carew-Pole said they all knew that certain housing estates wanted underground cables, but also that certain rural dwellers wanted a supply, and the Council must realise the cost of putting in underground lines was greater. Negotiations were going on at the highest possible level to try to hasten supplies to rural areas. She suggested that the Council's policy to date—of judging each case on its merits—was the more sensible one. After further discussion the resolution was referred back.

Eire

THE 100,000th consumer in the Electricity Supply Board's rural electrification programme was connected to the national network last week. The consumer was the Knockmeal Co-operative Creamery Ltd., at Ballinamult, Co. Waterford. The switching-on ceremony was carried out by Mr Lemass, Minister for Industry and Commerce, who said that about 25,000 rural consumers were now being connected each year. In the next few months it was planned to increase that figure to 33,000. He said that legislation would shortly be submitted to the Dail to increase the capital of the Electricity Supply Board, for purposes other than rural electrification, to £100 millions.

Rotherham

THE Corporation's Finance Committee has now recommended the Council to pay the B.E.A. £206,500 in full satisfaction of a claim by the Authority against the Corporation. This recommendation follows a report by the town clerk to the Committee reviewing the circumstances in which it is alleged large sums of money earned by the former electricity undertaking were transferred to the capital account. Originally the B.E.A. claimed for £82,666 surplus for 1946-47, and £235,000, being a portion of the surplus for the following financial year up to vesting day.

Sayings OF THE WEEK

"If we are to admit Japan to the comity of trading nations, then Japan must abide by the ordinary rules of international trade and must trade fairly" . . . SIR HARRY PILKINGTON, president of the F.B.I., speaking at Liverpool.

"New plant and machinery were becoming available to the pits, but the trained specialists were not there" . . . MAJOR N. E. WEBSTER, president of the Institution of Mining Engineers, speaking at Newcastle.

"The attitude that export sales could be conducted by a system of remote control was largely responsible for the loss, or lack of expansion" . . . MR J. DAVIS, talking on exports at Leamington, Warwicks.

S.E. Scotland

A STANDARD industrial tariff, incorporating the new bulk supply terms, is to be put into operation by the South East Scotland Electricity Board as from 1 April. Industrialists will have a choice of three tariffs, the present commercial block tariff; and two m.d. tariffs. In Edinburgh the initial running charge of the annual demand and unit tariff will be lower than in the rest of the Board's area. Edinburgh industrial consumers will, however, on average, pay about 4% more than at present. In the Central and Fife sub-areas, the Board's income will not be altered, but consumers in the Lothians and Southern sub-areas will on the whole benefit by the new tariffs, it is stated. As a further safety proviso, the Board will in 1954/55 limit the amount of any increases in consumers' charges to 7½% of the amount which would have been paid if the existing tariffs had continued in force.

S.W. Scotland

HAVING revised their standard tariff in the light of their present financial position and the increase in the bulk supply tariff from 1 Apr., the South West Scotland Electricity Board do not propose to increase any tariff at the present time. In view, however, of the alteration in the fuel variation adjustment in the bulk supply tariff, the Board have decided to make appropriate adjustments to the running charge and the fuel clause in their industrial and commercial m.d. tariffs and the restricted-hour tariff. These adjustments will not involve consumers in any increased payments but will in fact confer a benefit on them if and when the price of coal to the Board rises above its present price of 71s. 8d. per ton. In addition, in the case of the restricted-hour tariff and special agreements for off-peak supplies, the adjustments will mean a reduction to consumers in the basic unit price of 0·025d. per unit with coal at 71s. 8d. per ton. The adjustments will come into operation on 1 Apr.

The Board is also introducing a new tariff for commercial catering establishments, providing a flat rate of 1d. p.u., plus a fuel clause.

LIGHTING SCHEMES

Elie and Earlsferry. T.C. is seeking M.o.T. approval to conversion of street lighting from gas to electricity, at a cost of £4,147.

Greenock. Street lighting at Strone Farm housing scheme is to be changed to electricity at a cost of £2,350.

Liverpool. The City Lighting engineer is to prepare a scheme for converting the remainder of the street gas lighting to electricity.

St. Albans. The city surveyor, Mr A. S. Moody, is to submit a scheme and programme for the improvement of street lighting in the city.

York. T.C. Housing Committee is to seek ministerial approval to a scheme, costing £5,984, for installing street lighting on the Chapel Fields estate.

COMPANY ACTIVITIES

EXPECTATIONS that last year's 100% bonus by the Associated Electrical Industries group meant the beginning of a more liberal dividend policy, have been disappointed. After a careful study, one can only come to the conclusion that the board are not too happy about the replacement of assets. They have set aside extra depreciation of £1,377,000 for that purpose. Then, of course, they had to meet an E.P.L. payment of £1,340,000. That is the last of that. Allowing for the extra profits tax on distribution, which will have to be paid, the winding up of E.P.L. will mean the equivalent of an extra 10% on the Ordinary capital.

It will bring earnings, assuming maintenance of trading profit, up to nearly 46%, whereas the dividend including the so-called bonus of 1¼% just paid out has been established at 11¼% on the present capital.

Such dividend and "bonus" would be covered fully four times. Even if the board continued to set aside the special item for replacement of fixed assets, fully three times. And that is on a most conservative basis. In the ten years since the war, A.E.I. has made most impressive progress. The latest figure for trading profit, of £13,456,000, is over £10,000,000 more than for 1944. If it were a smaller undertaking its board might have to face up to a share-bidder. While nobody wants to see a company of such calibre become reckless, especially in such an industry, there is scope, I think, for a little more liberality on the dividend front.

Preliminary profits of Bakelite give no indication whatever why consolidated trading profits decreased from £547,000 to £296,000. In industries where profits are liable to fluctuate, interim reports commenting either half-yearly or quarterly are useful to shareholders. On the financial side, Bakelite have a good tax cushion which meant that net profits declined only from £201,000 to £149,000.

The Hoover undertaking goes into 1954 with still new high records for sales in January and February, states Sir Charles Colston, the retiring chairman and managing director, in his annual statement to shareholders. A great believer in incentive and teamwork, Sir Charles says that staff bonuses for the year amounted to £754,000, apart from piece-work incentives and sales commissions. This exceeds the total of the net dividend on all classes of shares which amounts to £645,000. Overcoming all taxation disabilities the company has financed tremendous expansions since the war out of its own resources, and has emerged with cash resources at the end of last year for Hoover Ltd. alone, totalling £2,847,000.

Considerable credit goes to the organisation for keeping prices down. That is probably the keystone of its prosperity. From 1938 to 1953 the general price level in Britain rose by more than 120%. Earnings rose by about 180%. The prices of raw materials rose by more than 220%. Taking comparable Hoover electric cleaners, the average price to the public (apart from p.t.) has risen by only about 28%. I agree with Sir Charles that this is quite a remarkable achievement. Even including purchase tax, his prices have risen by about 70%.—*From our City Correspondent.*

Bakelite Ltd.

Although the group profit of this concern for 1953 is over £200,000 lower than the figure for 1952, the total distribution for the year is maintained at 12½% with a 9½% final dividend. For 1953, the group profit is £562,660 as compared with £332,367 for 1952. That figure is arrived at after allowing all charges including £87,986 (*nil*) for special expenditure on the new Aycliffe factory and after crediting an earlier provision of £124,139 (*£16,184*). Debenture interest absorbs a further £24,083 and taxation £55,535 (*£321,300*).

Year to 31 Dec.	£ Trading Profit	£ Net Profit	% on Ord Earned	% on Ord Paid	Ord. Price High	Ord. Price Low
1949	248,093	112,229	112	10	40/3	36/3
1950	223,200	99,602	99	12½	44/4½	35/–
1951	293,081	108,325	113	15	55/3	45/–
1952	263,185	85,167	88	15	56/3¾	48/–
1953	423,726	136,256	136	25*	62/9	54/9

*Including special 10% bonus

Bruce Peebles and Co., Ltd.

The noteworthy increase in profit for 1953 we briefly noted last week. As our accompanying table indicates, there was a considerable increase in output last year. Sir William Darling, the chairman, states that output from the factory has increased by more than £500,000 to a total of over £2½ millions. This has reduced orders in hand by about 25%, but nevertheless, there is still considerable work in hand, and in sections dealing with larger plant, there is work ahead for several years. The many important orders for 1954 are such that we should achieve an output not less than that produced in 1953. The higher output last year has also resulted in converting an overdraft of about £50,000 into a substantial surplus.

Bylock Electric Ltd.

The dividend for the year ended 31 July last is 20% on capital increased by rights issue to £45,000. For the previous year the dividend was 50% on £15,000 capital. The group profit is £13,506, before charging taxation of £9,450, as against £16,576 for the preceding period.

Desoutter Brothers (Holdings) Ltd.

Home sales during 1953 were about 12% up on the previous twelve months' work, Mr G. H. Webb, the chairman, reports. Export sales also increased by nearly 3% in spite of extremely competitive conditions. The design department is fully engaged on research and experiments in, and the application of, new ideas in the field of small portable power tools, and it is hoped to put new models into production during the present year.

Elliott Brothers (London) Ltd.

Underwriting has been completed for the issue of 352,000 5s. Ordinary shares, to which we referred on 11 Feb. These shares are being offered to Ordinary stockholders in the ratio of two new shares for five existing stock units.

Hoover Ltd.

Total turnover in 1953, at home and abroad, was almost 20% greater than the record achieved in 1951, despite severer competition, Sir Charles Colston, the chairman, states in his review of activities. Total washing machine sales in the home market were practically double the 1951 figure, and about 50% higher than in 1952. In fact the company's washing machine business is now substantially larger than its electric cleaner business. Sir Charles claims that Hoover's sold in 1953 about one and a half times as many electric washing machines as all other mnufacturers put together. Despite earlier uncertainty regarding purchase tax, sales of electric cleaners were higher than for the two previous years, while the demand is brisk for the new steam and dry iron, he reports. Development work is also being done on a number of other appliances. The f.h.p. motor sphere is not so bright, however, for total sales, although higher than in 1952, were about 10% below the 1951 figure. In overseas markets, competition has been severe for all products, but Sir Charles is very optimistic of the prospects in New Zealand, Australia and South Africa, in particular.

Year to 31 Dec.	£ Trading Profit	£ Net Profit*	% on Ord Earned	% on Ord Paid	Ord. Price High	Ord. Price Low
1949	1,962,393	786,474	149	45	38/–	26/–
1950	2,984,238	996,883	95	37½†	52/3	34/3
1951	3,648,252	1,086,178	109	35	34/3	24/9
1952	2,226,171	518,572	52	25	27/9	21/–
1953	3,945,342	943,100	106	45	26/10	20/3

*Attributable to Hoover Ltd.
†Plus 100% capital bonus.

R. A. Lister and Co. Ltd.

Although the volume of products manufactured and sold by this group for the past year was a record, the profit figure dropped. Abnormal trading conditions continued throughout the

Year to 30 Sept.	£ Trading Profit	£ Net Profit*	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1949	625,676	230,777	15	11½†	46/–	32/3
1950	723,123	244,247	16	9	39/9	34/3
1951	832,983	233,746	16	9	40/3	30/–
1952	1,018,596	274,936	20	9	31/6	26/9
1953	988,508	219,154	20	12	34/3	27/9

*Available for parent company.
†Plus 100% capital bonus.

year, the chairman, Sir Percy Lister, states. Despite the handicaps of quotas and other restrictions in the export sphere, the company has, by developing markets in which its interests were not fully developed, secured a substantial increased volume of overseas trade. The current order book, now free from the drawbacks of a heavy post-war backlog, is in a healthy condition, he reports.

Mather and Platt Ltd.

The chairman, Mr L. E. Mather, reports that the situation in regard to orders and contracts received in the last few months of 1953 improved by comparison with the forecast he made in his statement with the previous report and balance sheet. Consequently the company has heavy order books in most departments, and none are short of work.

Radio Rentals Ltd.

The directors announce that they propose to offer 90,682 Ordinary 5s. shares to present holders at a price of 11s. per share, on the basis of one new share for every ten Ordinary held. These new shares will rank *pari passu* with the existing Ordinary shares except that they will not rank for the interim dividend in respect of the year ending 31 August next.

John Summers and Sons

This steel concern reports a trading profit of £1,659,605 for the 53 weeks ended 3 Oct. last, compared with £2,594,014 for the previous year.

Taylor Tunnicliff (Electrical Industries) Ltd.

Trading fell off during 1953, but Sir John Kent, the chairman, reports that there are some signs of improvement. Unless these latter indications are well maintained, rising costs combined with keener selling prices, are factors which are bound to influence the current year's

Year to 31 Dec.	£ Trading Profit	£ Net Profit*	% on Ord		Ord. Price	
			Earned	Paid	High	Low
1949	322,888	123,468	71	15	16/6	12/6
1950	359,922	136,360	79	20	16/6	13/6
1951	448,178	155,588	95	20	23/–	16/7
1952	418,944	153683	94	25	19/6	18/3
1953	376,634	158,727	45	12½†	12/4	9/4

*Attributable to parent company.
†Plus 100% capital bonus.

results, he warns. The recession in trade experienced in 1951 affected mainly the die-pressed products which most companies in this group manufacture. The balance sheet shows current assets at 31 Dec. last of £1,220,393 (*£1,140,845*), of which stocks accounted for £127,200 (*£164,165*).

Dividends Declared

Brown Brothers Ltd. Final dividend 11½% making a total of 14% (*12½%*). Group profit for 1953 is £230,300 (*£291,530*).

Ruberoid Co. Final dividend 20%, making 25% (*17%*) for year ended 3 Jan. last. Net profit is £145,662 (*£138,022*).

Thos. W. Ward. Interim of 5% (*same*).

QUESTIONS IN PARLIAMENT

East-West Trade

THE Government's attitude to trade between the U.K. and Russia was briefly given by Mr D. Heathcoat Amory in a written answer last week. He told Mr Donnelly that the visits of British businessmen to Moscow were actively encouraged and Mr Kabanov's list of Soviet requirements was being studied. A representative would be attending the Geneva meeting next month of experts on East-West trade, he added. In addition Mr Amory also stated that trade and financial negotiations with Poland had begun, and similar talks with Hungary and Czechoslovakia would start at a future date.

Women Factory Inspectors

EQUAL pay for women featured in a question on the factory inspectorate last week when Miss I. Ward asked under what agreement women grade II factory inspectors were granted equal pay and when it was proposed to extend the agreement to other grades. Sir W. Monckton informed her that women in class II had always had the same pay as men and it appeared to rest on a long-standing practice in recruitment rather than on any agreement. As regards other grades he referred to the Chancellor's reply on the subject of equal pay for women last November.

Smoke Pollution

A SUGGESTION by Mr Sorensen that a competitive reward be offered for inventions capable of domestic adoption to combat air pollution was turned down by Mr E. Marples. He gave an assurance that any suggestions were examined by experts and carefully considered.

Export of Electronic Goods

DIFFICULTIES were being encountered in the export of radio and electronic components, said Sir W. Smithers last week. This was due chiefly to formalities, he said, and asked if steps were being taken to ease those formalities. Mr R. A. Butler said he was aware that difficulties existed and appreciated the competition, especially as regards price, being met from German and other foreign exporters. The Government, he said, were doing everything possible to reduce formalities to a minimum and to remove obstacles to the flow of trade as much as possible.

Wayleave Inquiry

REGARDING the application of the B.E.A. to carry transmission lines across a farm known as Aitchison's Green, Gretna, Mr N. Macpherson asked why the report of the presiding officer at the subsequent inquiry had not been published. Mr L. W. Joynson-Hicks explained that the wayleave was granted by an administrative decision for which the Minister was wholly responsible. It would not be proper to publish the confidential report of the inspector who held the inquiry provided for by the Electricity (Supply) Act, 1919. Mr Joynson-Hicks also said the cost of altering the pylons later could not be given for publication.

Amalgamation of Divisions

RECENT B.E.A. announcement concerning the amalgamation of the N. Western and Merseyside and N. Wales Divisions was the subject of questions last week. Mr H. R. Gower asked if there was to be any opportunity for Welsh interests to state their views, and whether the Minister would ascertain if the decision was in the best interests of Wales. Mr C. Hughes asked a similar question but referred to the amalgamation of the corresponding Boards, which Mr L. W. Joynson-Hicks quickly corrected. The last named pointed out that the B.E.A.'s proposal would in no way affect electricity supplies to customers in either of the two divisions, which reply gave satisfaction.

Grid Line in Gloucester

A STATEMENT on the proposed transmission line between Birmingham and Melksham was asked for by Maj W. W. Hicks Beach. He asked if the Minister was aware of the dissensions in Gloucestershire over the B.E.A.'s proposals, and whether in view of the development of atomic energy, the propositions would become redundant. Mr G. Lloyd replied that a joint public inquiry into the application had been held and all the views put forward would be carefully considered when the report was received before a decision was reached. Mr Lloyd explained that transmission lines would still be necessary with electricity generated by nuclear energy.

Telegraph and Electricity Poles

ELECTRICITY and telephone authorities had reached agreement on 4,825 occasions last year to use the same poles to carry both services, Mr D. Gammans told Mr V. M. Vane last week. During the same period also 453 poles carrying both telephone and electricity lines were erected. The first figure concerned poles previously erected, and the second poles specially put up for the joint service. Mr E. R. Bowen asked later whether every effort was being made to bring about further co-operation in this field as it appeared to provide the only opportunity for some rural areas of receiving a supply of electricity. Mr Gammans assured him that the closest co-operation existed between the two authorities.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders, unless otherwise stated.

12 Mar.—Ashton-in-Makerfield U.D.C. Installation in 74 houses on Bolton Rd estate.—See 25 Feb. issue.

12 Mar.—Southend-on-Sea T.C. P.i.l.c. underground main and street lighting fittings at Connaught Hse.—Advertised in 18 Feb. issue.

13 Mar.—Airdrie T.C. Lamps during year from 16 May.—See 11 Feb. issue.

13 Mar.—Dublin. Horizontal centrifugal high lift and low lift pumps.—See 11 Feb. issue.

13 Mar.—Dundalk. Rewiring and supply of storage heating at St. Mary's Hospital, Drogheda.—See 25 Feb. issue.

13 Mar.—Liverpool T.C. Equipment for lighting pedestrian crossings.—See 4 Mar. issue.

13 Mar.—Whitley Bay U.D.C. Installation in 20 houses in Hill Heads Rd.—See 4 Mar. issue.

15 Mar.—Bath T.C. Installation in renovation of Cross Bath.—See 4 Mar. issue.

15 Mar.—East Riding. Installation at Brough secondary school.—See 18 Feb. issue.

15 Mar.—Eston U.D.C. Equipment for group B street lighting.—See 4 Mar. issue.

15 Mar.—N. Ireland. Installation at Rainey school, Magherafelt.—See 25 Feb. issue.

15 Mar.—Skegness U.D.C. Generating sets and sewerage pumping machinery at Richmond Drive pumping station.—See 25 Feb. issue.

16 Mar.—Aberdeen. Electrical installation in extensive additions to Gordon Schools, Huntly. County Architect's Dept., 25 Union Terr. Deposit £5. 5s.

16 Mar.—Belfast T.C. Installation at Ardoyne fire station.—See 4 Mar. issue.

16 Mar.—N. Ireland. Lighting and heating in Oliver Plunkett Hall.—See 4 Mar. issue.

18 Mar.—Westmeath (Eire). Installation in clinic at Mullingar.—See 25 Feb. issue.

19 Mar.—Beccles T.C. Supply of electric lamps in year from 1 Apr. Borough and Water Engineer, Municipal Offices.

19 Mar.—Bromley T.C. Rewiring St. Mark's C.E. primary school. Borough Engineer, Municipal Offices.

19 Mar.—Nottingham T.C. Improved lighting along trunk road A.614.—Advertised in 4 Mar. issue.

20 Mar.—Amersham R.D.C. Centrifugal pumps, electric motors, switchgear, etc., for Little Chalfont drainage scheme.—See 4 Mar. issue.

20 Mar.—Golborne U.D.C. Electrically driven water booster plant at Houghton Coat.—See 25 Feb. issue.

20 Mar.—Hemel Hempstead T.C. Supply of lamps in fiscal year 1954-55. A. H. Turner, Borough Engineer, Market Sq.

20 Mar.—Sutherland. Installation in dwellings at Tongue and Bettyhill.—See 4 Mar. issue.

22 Mar.—The Dearne U.D.C. Mercury vapour and fluorescent lighting along Claydon Lane and George St, Thurnscoe.—See 25 Feb. issue.

22 Mar.—Maidstone T.C. Installation in 88 flats on Shepway estate.—See 4 Mar. issue.

22 Mar.—Manchester T.C. Electrical installation in 14 shops and 244 dwellings at Middleton.—See 25 Feb. issue.

22 Mar.—N. Ireland. Electrical installation in block of 2 shops, 20 flats and an office at Redmanville, Portadown. N.I. Housing Trust, 12 Hope St, Belfast. Deposit 10s.

22 Mar.—Yeovil T.C. Steel columns, and lamps, for street lighting.—Advertised in 25 Feb. issue.

23 Mar.—Arbroath T.C. Electrical work in total of 34 flats and 14 shops in Seaton Rd shopping centre. W. R. Samson, housing architect, 32 Hill St.

23 Mar.—Laoighis (Eire). Electrical installation in nurses' home at Port Laoighis. J. C. Costello, consulting engineer, 21, Leeson Park, Dublin. Deposit £6. 6s.

24 Mar.—Belfast. Electrical installation in extension to St. Joseph's primary school, Slate St. A. N. Irens, consulting engineers, 58 Howard St. Deposit £3s. 3s.

24 Mar.—Harrogate T.C. Lamps in year from 1 Apr.—See 4 Mar. issue.

24 Mar.—Ilford T.C. Pumps, motors and other equipment for sewage at pumping station.—Advertised in 4 Feb. issue.

24 Mar.—Littlehampton U.D.C. Installation in 30 houses on Wickbourne estate.—See 25 Feb. issue.

24 Mar.—Luton T.C. Installation in Farley school extension.—See 4 Mar. issue.

26 Mar.—Belfast T.C. Two sets of central evaporating plant for power station West.—Advertised in 28 Jan. issue.

26 Mar.—Belfast T.C. Automatic water jet fire fighting and alarm installation at power station West.—Advertised in 25 Feb. issue.

26 Mar.—Belfast T.C. L.T. switch-fuse distribution board.—Advertised in 4 Mar. issue.

26 Mar.—Erpingham (Norf.) R.D.C. Two electrically driven submersible type borehole pumps, etc., for Matlaske/Holt water supply.—See 4 Mar. issue.

26 Mar.—Lees U.D.C. Group B street lighting involving supply and erection of 34 concrete columns, lanterns with 45 W sodium lamps and gear in Stamford Rd, and St. John St. Also similar scheme in Spring Lane and Thomas St involving 28 lighting units. Separate tenders. Council Offices, Lees. Deposit £2. 2s. in each case.

26 Mar.—Liverpool. Underground distribution supply services, lighting, power, fire alarms, telephones, road lighting, etc., for mental deficiency colony at Greaves Hall, Banks. Applications by above date to V. Collinge, secretary, Liverpool Hospital Board.

26 Mar.—N. Ireland. Electrical installation in buildings at Fever Hospital, Purdysburn. F. W. Parkinson and Partners, consulting engineers, 6 Murray St, Belfast. Deposit £3. 3s.

29 Mar.—Gravesend T.C. Rewiring and supply of equipment at Central Public Library. Borough Engineer and Surveyor, 6 Woodville Terr. Deposit £1. 1s.—Advertised in this issue.

29 Mar.—Manchester T.C. Installation in public wash-house, Openshaw.—Advertised in 4 Mar. issue.

29 Mar.—Manchester T.C. Electrical installation at new central stores, Newholme. City Architect, Town Hall. Deposit £1. 1s.

30 Mar.—Godalming T.C. Electrical installation in about 304 houses on Farncombe estate. Engineer and Surveyor, Branksome, Filmer Grove.—Advertised in this issue.

30 Mar.—Southgate T.C. Supply of lanterns and control gear for 120 140 W sodium vapour discharge and 47 mercury vapour discharge lamps; and supply and erection of 167 concrete columns and fixing of lanterns etc. Borough Engineer and Surveyor, Town Hall, Palmers Green, N.13.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 103 queries answered this week

Floodlighting equipment suitable for a hotel on hire for about 6 months, suppliers of? L.L.—Strand Electric and Eng. Co., Ltd., 29 King St, W.C.2; Floodlighting and Fittings Ltd., 294 Grays Inn Rd, W.C.1.

"Aquadag" colloidal graphite, makers of? A.E.R.—Acheson Colloids Ltd., 18 Pall Mall, S.W.1.

"Rola" loud speakers, address for? R.B.C.—Rola Celestion Ltd., Ferry Works, Summer Rd, Thames Ditton.

"Hetco" hair dryers, makers of? H.G.W.—Henry E. Taylor Ltd., 13/15a Queensway, Enfield, Middx.

Domestic dishwashing machines, makers of? T.B.C.—Andrews Bros (Bristol) Ltd., Stainless House, Weston-super-Mare; W. H. Paul Ltd., Beeston, Derby; Atack-Turner Ltd., Chapel St, Manchester; Dishmaster (Ldn) Ltd., 151 Gt Portland St, S.W.1.

"Kontite" conduit fittings, makers of? R.A.F.—Kay and Co. (Engineers) Ltd., Bolton Brass Works, Blackhorse St, Bolton.

ANSWER WANTED

"Perfectometer" cable length measuring device, makers of? L.E.C.

3 Apr.—Long Eaton U.D.C. Contract 3 invites tenders for sewage pumping machinery comprising provision of three electrically driven and one diesel engine driven vertical spindle centrifugal sewage pumps with necessary control gear. Francis Turner, Engineer and Surveyor, Town Hall.

3 Apr.—Newbury (Berks) R.D.C. Wiring of 210 council houses on various sites. Surveyor, Phœnix House, Bartholomew St.

3 Apr.—Newcastle-on-Tyne T.C. Electrical installation at Rutherford grammar school. City Architect, 18 Cloth Market. Deposit £1. 1s.

5 Apr.—Newcastle-on-Tyne T.C. Electrical installation in N. Fawdon county primary school. City Architect, 18 Cloth Market. Deposit £1. 1s.

6 Apr.—Newcastle-under-Lyme T.C. Street lighting installations in group A along two stretches of roads. Two contracts: first involves supply and erection of equipment and second mainly installation only. Borough Engineer, Lancaster Bldg, High St. Deposit £2. 2s.—Advertised in this issue.

9 Apr.—Belfast T.C. Heating and ventilating plant for 33 kV switch-house at power station West.—Advertised in 4 Mar. issue.

12 Apr.—Harwich T.C. Five sets of sewage pumps, two comminutor sets and ancillary equipment at Fernlea Rd station.—See 4 Mar. issue.

21 Apr.—Fifeshire. Installation in High School at Kirkcaldy.—See 25 Feb. issue.

No date stated—Malden and Coombe T.C. Sodium lamps on concrete columns for group A lighting in Coombe La.—Advertised in 4 Mar. issue.

No date stated—N. of Scotland H.E. Board. Construction of wood pole o.h. lines in W. Perthshire.—Advertised in 4 Mar. issue.

No date stated—Sunderland T.C. Electrical goods, fires and cable for 1954 housing.—See 4 Mar. issue.

. . . and Overseas

Details of items marked may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

25 Mar.—Uruguay. Supply of transformer unit and various materials under tender No. 3972/54, specif. 2256, for Usinas Electricas y los Telefonos del Estado. B.o.T. (Ref.: ESB 5106/54).*

2 Apr.—India. Supply of 24 250 kVA 1250 V 1030 c/s power factor capacitors. Director-General, India Store Dept., 32-44 Edgware Rd, London, W.2. Ref.: 1836/53/CIV. Documents at 10s. a set.

7 Apr.—S. Africa. Supply of metal plate rectifier or motor generator for supplying d.c. in electroplating shop. Output 1,000 A at 12 V required. Tender c.7,519. Stores Department, S. African Railways. B.o.T. (Ref: ESB 5594/54).*

20 Apr.—Iraq. Supply of two slow or medium speed horizontal or vertical compression ignition oil engines with alternators, exciter control panel and feeder or distribution panels. Tender 8. Directorate General of Municipalities, Baghdad. B.o.T. (Ref: ESB 5393/54).*

22 Apr.—Egypt. Construction of h.v. transmission lines and switch stations for feeding transformer stations of El Deshondi and other electrical pumping stations. Specifs. available from Commercial Counsellor, Egyptian Embassy. 75 S. Audley St, W.1, at £10. 5s. 2d.

22 Apr.—Kuwait. Supply of 11 kV 415 V and pilot paper cables for Phase 2 of 11 kV power distribution system. President of Electricity Dept., Govt. of Kuwait.—Advertised in 4 Mar. issue.

28 Apr.—Australia. Supply of two metal clad, floor mounting, enclosed, 415 V distribution switchboards for each of Capricornia and Townsville Electricity Boards. Specif. 427. State Electricity Commission of Queensland, Scottish Union House, 127 Eagle St, Brisbane. Copy of specification at 10s. 6d. B.o.T. (Ref.: ESB 5376/54).*

29 Apr.—Kuwait. Supply, erection etc. of 11 kV metalclad switchgear for phase 2 of 11 kV distribution system. Dept. of Electricity, Govt. of Kuwait.—Advertised in this issue.

29 Apr.—Kuwait. Supply of 25 500 kVA 11/·433 kV power distribution transformers for phase 2 of 11 kV power distribution system. President of Dept. of Electricity, Govt. of Kuwait.—Advertised in this issue.

30 Apr.—Luxembourg. Supply of two turbines, 2 valves, 2 sluice gates, etc., for hydro-electric scheme at Rosport. Ministry of Transport and Electricity. B.o.T. (Ref.: ESB 5281/54).*

6 May—Egypt. Modification of switchgear at Mansourah substation and extension of h.t. network at Mansourah. Municipalities Admin., Ministry of Municipal and Rural Affairs, Kasr-el-Doubara Port Office, Cairo. £E3 per set. B.o.T. (Ref: ESB 5373/54).*

11 May—New Zealand. Supply under contract 254 of 10 MVA 110/11 kV transformer bank and spare for Gisbourne substation. Documents at N.Z. Govt. Offices in Strand, London.

13 June—New Zealand. State Hydro-Electric Dept. invites tenders for supply of two 312·5 kVA auxiliary generating sets for Atiamuri power station. Deposit is £100 and bond £435. Documents at N.Z. Govt. offices in London.

Date not known—New Zealand. Supply of three 23,334 kVA 220/11 kV transformer banks and spare unit for Atlantic hydro-electric power station. Specifications available from N.Z. Government Offices in London.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 9 March

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	236	+1	285
„ (3 months)	226	+5	—
LEAD, refined pig, min. 99·97% purity (cash)	86½	+3½	93⅜
„ (3 months)	85⅝	+3¼	90⅝
TIN, refined, min. 99·75% purity (settlement)	710	+20	957½
„ (3 months)	682½	+17½	943½
ALUMINIUM, ingots 99·99·5%	156	—	166
ZINC, virgin, min. 98% purity (cash)	73⅜	+1½	78⅛
„ (3 months)	72⅜	+1½	78$\frac{3}{16}$
RUBBER No. 1, RSS, spot (per lb)	16½d.	—	22½d.
„ c.i.f. basis, ports. Apr. (per lb)	16$\frac{1}{16}$d.	−$\frac{1}{16}$d.	22⅝d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	52	—	51½
Mild Steel Tape (0·014 in.)	40	—	39½

Contracts Placed

Bexley (Kent) T.C. Electrical work at grammar school, Troughton and Young Ltd., £5,938.

Brighton. Wiring and fittings for lighting and power installation at Sussex Maternity Hospital, Sayers and Son (Brighton) Ltd., £1,653.

Deal (Kent). Reconstruction of electrical services at Victoria, Deal and Walmer Memorial Hospital, G. E. Wallis and Sons (Electrical) Ltd., £1,108.

Durham. Electrical installation in Felling (£890), Jarrow (£906), and Billingham (£895) civil defence control centres, Doves (Darlington) Ltd.

Hythe T.C. Street lighting on trunk road A.259: supply of lanterns, British Thomson-Houston Co., Ltd., £1,511; and of columns and fixing of lanterns, Cohen Bros. (Electrical) Ltd., £4,019.

London. Electrical installation at Adamsrill primary school, W. M. Grant and Co., £2,363; also installation of lifts on housing estates, J. and E. Hall, Ltd., £56,750.

London. Electrical installation in war damage work at Guildhall, Alliance Electrical Co., Ltd.

Manchester T.C. Electrical installation in 30 flats at Woodhouse Park and 68 in Newcastle St, Hulme, Lindsay Crawford Engineering Corpn. of Kidderminster; same in 334 houses in Greenwood Rd, Woodhouse Park, F. L. Bampton Ltd.

Willesden T.C. Electrical work in Bridge Rd school, Watson and May, £2,553.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Scoba. 717,486. Class 9. Electrical apparatus and instruments, etc. Scoba Ltd., Gatwick Airport, Horley, Surrey.

Stertel. 720,930, Class 9. Insulated electric cables. Sterling Cable Co., Ltd., Sterling Works, Aldermaston, Berks.

Tenswick. 725,141. **Metromatic.** 725,146. Class 9. Electric arc welding apparatus etc. Metropolitan-Vickers Electrical Co., Ltd., 1/3 St. Paul's Churchyard, E.C.4.

Tub. 723,415. Class 11. Air deodorising apparatus. Tenaplas Ltd., Upper Basildon, near Pangbourne, Berks.

Wireohms. 702,803. Class 11. Thermo-electric heating elements. Wireohms Ltd., Peas Hill Rd, Nottingham.

BUSINESS PROSPECTS

Home

Bangor (Caern.). Technical college to be built at Ffriddoedd at cost of about £100,000.

Barking T.C. It is proposed to build 282 dwellings on Thames View estate. Site works is out to tender.

Barrow-upon-Soar (Leics.) R.D.C. Thirty houses to be built in district, 32 each at Mountsorrel and Woodhouse Eaves and 14 other dwellings.

Belfast T.C. Erection of 172 houses and 34 flats on Clare Park estate, and 9 other houses. Housing Architect's Dept., 94 Chichester St.

Billingham-on-Tees U.D.C. Plans by I.C.I. Ltd. approved for extension to cement plant office block.

Birmingham. Hospital Board is seeking approval for reconstruction of operating theatre block at Accident Hospital costing £110,000; modernisation of part of Selly Oak Hospital costing £95,000; operating theatre block and X-ray dept. at Little Bromwich Hospital costing £94,500; and casualty and admission units at Dudley Hospital to cost £40,000.

Bournemouth T.C. Tenders to be invited shortly for erection of police headquarters in Madeira Rd. Estimated cost £90,000.

Buckinghamshire. Construction of junior school at Far Bletchley. County Architect, County Offices, Aylesbury.

Canterbury T.C. Erection of houses and maisonettes. L. Hugh Wilson, city architect, Municipal Buildings.

Cheshire. It is proposed to build secondary modern school at Weaverham. Land has been acquired. Also scheme approved for completion of county offices near Chester Castle at estimated cost of £290,000.

Colwyn Bay T.C. Construction of 67 houses on Elwy estate, Rhos-on-Sea. Architect is S. Colwyn Foulkes, Merton Place, Pwllycrochan Ave.

Crewe T.C. Amended scheme approved for erection of 120 houses and 24 bungalows on Wistaston Green estate.

Crook U.D.C. Plans in hand for 160 houses near Hall Lane, 60 at Hunwith and 80 at Billy Row.

Croydon T.C. Plans submitted for factories in Gloucester Rd to plans by J. Chapman, and for Thomas Pay and Sons, London, S.E.8, in Vulcan Way, Addington.

Darlington. Ministry to inquire into local £310,000 scheme for additions to sewage works. Sketch plans approved for first stage of college of further education. T.C. to build 300 houses this year and Borough Architect authorised to invite tenders as and when required.

Derby. A. P. Taylor, 59 Chapel St, Belper, is architect for new congregational church and hall in Enfield Rd, estimated to cost £17,000.

Dorchester R.D.C. Construction of 40 houses at Charminster—first of 73 houses. Architect is F. E. Jay, 58 High West St.

Dublin T.C. Erection of school in Glasanaon Rd, Finglas East. A. F. Reddy, chart. quantity surveyor, 23 Ely Place, Dublin.

Dundee T.C. Plans approved for 300 houses in West March scheme.

Dungannon U.D.C. Construction of 78 houses in Killyman Rd. Roe, Stevenson and Sons, quantity surveyors, 33 College Gardens.

Eastbourne. Applications made by Tolimit Gauges Ltd., London, S.W.6, and by Hotchkiss (Eastbourne) Ltd., for erection of factories on sites at Brampton Rd, trading estate.

Esher (Sur.) U.D.C. Tenders likely to be invited soon for installation of electricity in 38 houses.

Gateshead T.C. Multi-storey flats proposed in East and Peareth Sts. Plans to be prepared.

Glasgow. Dean of Guild Court has approved plans for reconstruction of Lyric Theatre for Y.M.C.A. at cost of about £90,000. Also, senior secondary school to be built adjacent to Lightburn Hospital in Carntyne Rd.

Golborne U.D.C. Erection of 50 houses at Culcheth. J. B. Hoyle, Engineer and Surveyor, Council Offices, Lowton, nr. Warrington.

Guildford T.C. Tenders will probably be invited soon for erection of 114 houses at Park Barn and 24 flats at Bushy Hill.

Hackney B.C. It is proposed to build 84 flats on Clapton Common site.

Haywards Heath. It is proposed to build £109,000 admission villa at St. Francis Hospital. Sketch plans approved.

Huddersfield T.C. Construction of county junior school at Crosland Moor. Borough Architect, High St Buildings.

Hungerford (Berks) R.D.C. Layout plans approved for 76 houses and three shops with flats at Priory Park.

Kirkcudbright. Erection of junior secondary schools at Dalbeattie, Castle-Douglas and Western Area, and primary schools at Kirkcudbright and Glentrool. County Architect, County Offices.

Leominster (Her.) T.C. Plans approved for factory in South St for Dent, Allcroft and Co., Ltd. of Palace Yd, Worcester.

Longbenten U.D.C. Twelve bungalows and 36 houses to be built on Kelvin Park estate.

Nuneaton T.C. Forty-eight flats proposed in one block in Vernons Lane.

Oxford T.C. Revised layout approved for 322 dwellings in Minchery Farm estate.

Skipton U.D.C. Tenders likely to be invited soon for erection of 100 houses and 24 bungalows on Horse Close estate.

Smethwick T.C. Erection of C.D. control centre. Borough Engineer and Surveyor, Council House.

Southgate T.C. C. E. Owen Ward, Midland Bank Chambers, Aldermans Hill, N.13, is architect for factory and offices in Chase Rd.

Southport T.C. Approval received for layout of new Radnor Dve estate providing for total of 211 houses, 38 flats, 6 maisonnettes and 6 shops.

Stourbridge. Approval sought for outpatients and casualty dept. at Corbett Hospital which is calculated to cost £200,000.

Thame (Oxon) U.D.C. Scheme proposed for erection of 68 dwellings on Wellington St site.

Tynemouth T.C. Plans approved for 220 houses at Chirton Grange and for school in Wallington Ave.

West Hartlepool T.C. Approval granted for R.C. church in Stratford Rd. Architect is T. A. Crewford, 80 Borough Rd, Middlesbrough.

West Kilbride. Erection of factory being planned by J. A. Portch, 14 Moludinar St, Glasgow.

West Riding. Work expected to start in June on £101,000 Liversedge secondary school. Second instalment of secondary technical school to cost about £108,200; approval recommended. It is proposed to erect new junior and infants' school at Birstall.

Wombwell (Yorks) U.D.C. Erection of 50 houses on Wilson St estate. C. Knowles, council's architect, Town Hall.

Overseas

India. Lathes, electric motors, generating sets and diesel engines among goods that Vasant and Co., 21 Alli Chambers, Medows St, Fort, Bombay, are interested in importing.

New Guinea. Colyer Watson (N.G.) Ltd., of 22 Bridge St, Sydney, Australia, would like quotations from U.K. manufacturers of electrical appliances, including domestic refrigerators, stoves, grillers and radios. Area covered by this firm includes New Britain, New Holland and north-eastern New Guinea.

U.S.A. Quotations on portable electric food mixers will be welcomed by Clark Turner and Associates, 383 Brannan St, San Francisco. Quantity involved is 2,000 to start with and they wish to buy at between $4·50 and $5·50 each, including import duty.

Gazette Announcements

COMPANIES ACTS

Harrison and Co. (Electrical) Ltd. A. E. Attwood, of 20-21 Lawrence La, Cheapside, E.C.2, liquidator, has been released as from 9 Oct. 1953.

Winding-Up

M. S. Webb and Sons Ltd. At first meeting of creditors under a winding-up order made on 25 Jan., Official Receiver reported that company was formed with nominal capital of £1,000, of which £500 had been issued. No statement of affairs had been filed but according to Mr Montague Seth Webb, director, there were no assets and liabilities amounted to about £1,900. No resolution was passed and matter was left with Official Receiver as liquidator.

Ascwa Heating Ltd., heating and ventilating engineers. At first meeting of creditors Official Receiver reported that statement of affairs disclosed unsecured liabilities of £1,925, all due to trade and expense creditors. In addition there was preferential claim for £40. Assets estimated to realise £219 and deficiency to creditors was expected to be £1,746. Company was formed in 1951 with a nominal capital of £700, of which £583 had been issued. No resolution passed and matter was left in hands of Official Receiver as liquidator.

BANKRUPTCY ACTS

Intended Dividend

Brentford. Lionel J. Quick, electrical distributor trading at 2 The Mall, Ealing, W.5. Last day for receiving proofs, 17 Mar. Trustee is R. A. Rodgers, of 25 Bedford Row, W.C.1.

MEETINGS TO NOTE

THURSDAY, 11 MAR.

I.E.E. (London).—"An 8-MeV Linear Accelerator for X-ray Therapy," C. W. Miller. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Scotland).—"Economics of o.h. Equipment for d.c. Railway Electrification," O. J. Crompton and G. A. Wallace. Royal Hotel, Dundee, 7 p.m.

I.E.E. (Swansea).—"Design of Certain British Power Stations," S. D. Whetman and A. E. Powell. Public Library, Alexandra Rd, 6 p.m.

I.E.S. (Manchester).—"Street Lighting Costs, T. L. Robinson. Elect. Offices, Town Hall Extension, 6 p.m.

E.P.E.A. (Merseyside).—"Gas Turbines," F. Hickson. Elect. Showrooms, Whitechapel, Liverpool, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (Scottish).—"Acoustic Design and Measurement of Buildings," H. C. Watson. 39 Elmbank Cres, Glasgow, 7 p.m.

BRITISH INSTN. OF RADIO ENGRS. (N. Western).—"Colour Television," G. B. Townsend. College of Technology, Sackville St, Manchester, 7 p.m.

FRIDAY, 12 MAR.

I.E.E. (Western).—Annual dinner and dance at Seabank Hotel, Porthcawl, 7 p.m.

I.E.S. (Nottingham).—Ladies' Evening at Victoria Station Hotel.

BRITISH INSTN. OF RADIO ENGRS. (Scottish).—"Acoustic Design and Measurement of Buildings," H. C. Watson. The University, Edinburgh, 7 p.m.

TELEVISION SOC.—"Trick Effects in TV Production," D. R. Campbell. 164 Shaftesbury Ave, W.C.2, 7 p.m.

MANCHESTER ASSOC. OF ENGRS.—Dinner and dance at Grand Hotel.

A.S.E.E. (Stoke and Crewe).—"Lighting in the Theatre," P. Corry. Copeland Arms Hotel, Stoke, 7.30 p.m.

SATURDAY, 13 MAR.

I.E.E. (Cambridge Radio).—Visit to Atomic Energy Research Establishment at Harwell.

MONDAY, 15 MAR.

I.E.E. (Mersey and N. Wales).—"Co-ordination of Insulation of High-Voltage Electrical Installations," J. S. Cliff. Town Hall, Chester, 6.30 p.m.

I.E.E. (N.E. Radio and Measurements).—"Properties of Matter affecting Valve Reliability," E. A. O'Donnell Roberts. King's College, Newcastle, 6.15 p.m.

I.E.E. (Norwich).—"Modern Developments in Atomic Energy," T. E. Allibone. Royal Hotel, 7.30 p.m.

I.E.E. (Reading).—"Contribution of Plastics to Cable Manufacture," H. F. Wilson. George Hotel, 7.15 p.m.

IPSWICH ELECTRICAL ASSOC.—"Electronic Motor Control," E. J. P. Long. Electric Hse, 7.30 p.m.

BIRMINGHAM ELECTRIC CLUB.—Annual meeting. "Two Birds with One Stone," D. H. Kendon.

TUESDAY, 16 MAR.

I.E.E. (London Measurements).—"Minimum-Moment-of-Error-Squared Criterion: New Performance Criterion for Servo Mechanisms," J. H. Westcott; "Remote Position Control Servo Mechanism with Hard-Spring Non-Linear Characteristics," J. C. West and P. N. Nikiforuk. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Midland Utilisation).—"Utilisation of Electric Power in Oilfields," G. Gascoigne; "Induction Motor Drives and Methods of Control," G. F. Shields and H. Myers. Elect. Offices, 1 Whitehall Rd, Leeds, 6.30 p.m.

I.E.E. (N.W. Utilisation).—"Electricity in Wool Textile Industry," A. J. Francis and T. H. Carr. Engrs. Club, Albert Sq, Manchester, 6.15 p.m.

I.E.E. (S.E. Scotland).—"Aspects of Design of V.H.F. Mobile Radio Systems," E. P. Fairbairn, Heriot-Watt College, Edinburgh, 7 p.m.

I.E.S. (Liverpool).—"Outdoor Illuminations," H. Carpenter. Elect. Offices, Whitechapel, 6 p.m.

A.S.E.E. (London).—"Industrial Photo-Electric Cells and Amplifiers," D. H. Taylor: "Neon Signs," C. A. Jones: "Electrical Protection of 3-phase a.c. Motors," S. H. Harding.

WEDNESDAY, 17 MAR.

I.E.E. (N.W. Radio).—"Distributed Amplifiers," W. S. Percival. Engrs. Club, Albert Sq, Manchester, 6.30 p.m.

I.E.E. (Oxford).—"Modern Trends in TV," G. G. Gouriet. Elect. Offices, 37 George St, 7 p.m.

I.E.S. (N. Lancs) and A.S.E.E. (Preston).—"Outdoor Illuminations," H. Carpenter. Elect. Offices, 19 Friargate, Preston, 7.15 p.m.

I.E.S. (Tees-side).—"Lighting in Schools," J. W. Howell. Cleveland Scientific and Tech. Inst., Corporation Rd, Middlesbrough, 6.30 p.m.

THURSDAY, 18 MAR.

I.E.E. (London Utilisation).—Discussion on "Training and Responsibilities of Marine Electrical Engineers," G. O. Watson. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Mersey and N. Wales).—Dinner-dance at Hulme Hall, Bolton Rd, Port Sunlight, 7 p.m.

I.E.E. (Irish).—Electrical Requirements of Hospitals," R. J. Flood. Trinity College, Dublin, 6 p.m.

I.E.S. (Bradford).—"X-Rays," E. Hudson. Elect. Offices, Sunbridge Rd, 7.30 p.m.

E.A.W.—Film show at Assoc. H.Q. 2.15 p.m.

FRIDAY, 19 MAR.

I.E.E. (Rugby).—Annual Ball (with Rugby Engineering Soc.) at Chesford Grange Hotel, Kenilworth, 8.15 p.m.

BRITISH REFRIGERATION ASSOC.—Annual luncheon at Connaught Rooms, Gt. Queen St, W.C.2, 12.30 p.m.

Trade Notes

Changes of Address. The Birmingham offices of Hoover Ltd. are now at 12 Harborne Rd, Edgbaston. Telephone No. Edgbaston 3568. The new address of Pamelec Ltd. is 27 Hatchlands Rd, Redhill. Telephone Redhill 3461.

Cooker Switches for S.A. Application has been made to the Union of South Africa Board of Trade and Industries for the withdrawal of rebate facilities on multi-heat switches for the manufacture of electric cookers and hotplates. U.K. firms desiring to submit evidence for their retention should communicate with the B.o.T. at Lacon Hse, Theobalds Rd, W.C.1, quoting ref. CRE 2324/54.

Egyptian Customs Changes. Among alterations in the Egyptian Custom tariff, just announced, electric heating apparatus and electric and electro-technical apparatus for domestic use is now charged at 50% instead of 30% previously, and reflectors, lampshades and similar lighting apparatus carry a duty of 20%.

Extension. The Backer Electric Co. is planning extensions to its Rotherham factory, it is reported.

London Representatives. Legg (Industries Ltd., have appointed Mr W. E. Parish, 20 South Hill Park Gar, Hampstead, N.W.3 (Telephone Hampstead 6890) as their sales engineer for the London area.

Thermostats for Australia. In changes in the Australian Customs tariff, British made thermostats used with electric domestic appliances are now duty free.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

Bernard Hendry Ltd. Radio and electrical engineers, etc. Nom. cap.: £10,000. Dir.: B. Hendry, 92 Dumbleton Av, Leicester. Sub.: Mrs C. M. Hendry, of same address.

Edge and Bolton Ltd. Trelawn Hse, North Bar, Banbury, Oxon. Furniture, mechanical, electrical, structural, architectural, domestic, industrial, fashion and fabric designers and consultants, etc. Nom. cap.: £1,000. Dirs.: F. E. Bolton and W. B. B. Edge.

Electricmasters Ltd., 28 Park Row, Nottingham. Dealers in and repairers of radio and television sets, etc. Nom. cap.: £1,050. Dirs.: T. Grimes, W. Taylor and H. W. D. Slight.

Electrical Products Export (International) Ltd., 5 New Sq, Lincoln's Inn, W.C.2. Nom. cap.: £2,000. Dirs.: R. A. A. Palagyi, D. de Jankovich and E. F. W. Besly.

H.A.T. Power Station Consultants Ltd., Fairfax Hse, Fulwood Place, High Holborn, W.C.1. Consultants and advisers in scientific research and development, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: N. W. Smyth, Fairfax Hse, Fulwood Place, High Holborn, W.C.1, and M. J. Briggs, 10 Ormonde Ct, Upper Richmond Rd, Putney, S.W.15.

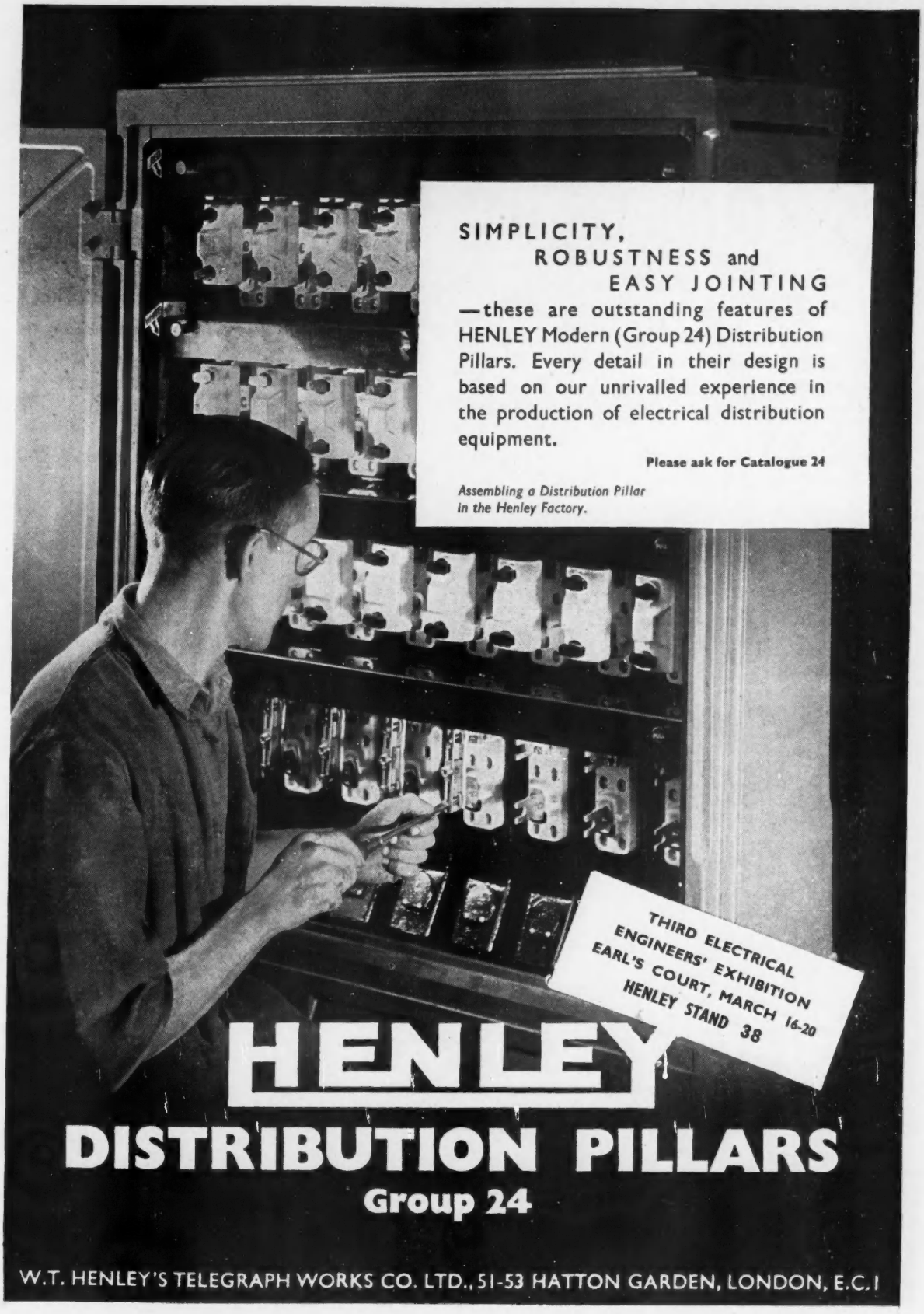
H. and M. Electrical (London) Ltd., Station Bldgs, Bruce Grove, Tottenham, N.17. Electrical engineers and contractors, etc. Nom. cap.: £1,000. Dirs.: A. F. Moxon, D. Hammond, C. L. Moxon and C. D. W. Moxon.

Hydro-Kinetic Power Transmission Ltd., 18 Bolton St, Piccadilly, W.1. To acquire and protect patents and patent rights connected with power transmission mechanisms and change speed mechanisms, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: E. H. Riches, 18 Bolton St, Piccadilly, W.1, and Joan M. Vine, 221 Walton Rd, East Molesey.

Mid-Bucks Electrical Services (Subsidiary) Ltd., 79/81 Tring Rd, Aylesbury, Bucks. To take over business of Mid-Bucks Electrical Services Ltd. incorporated in 1948, electricians, electrical, wireless, television and general engineers, etc. Nom. cap.: £100. Dirs.: L. E. Cogger, W. J. Hawkins and D. C. Arnold.

Modern Linegear Ltd., Bush Lane Hse, Cannon St, E.C.4. Electrical, mechanical, hydraulic and general engineers and contractors, etc. Nom. cap.: £5,000. Dirs.: R. H. Stockford and Myrtle R. Stockford.

Storm Electronic Equipment Ltd., 18 Ernle Rd, Wimbledon, S.W.20. Research workers, manufacturers of and dealers in electronic devices, etc. Nom. cap.: £1,000. Dir.: L. Urmenyi and F. A. Singer.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—these are outstanding features of HENLEY Modern (Group 24) Distribution Pillars. Every detail in their design is based on our unrivalled experience in the production of electrical distribution equipment.
Please ask for Catalogue 24
Assembling a Distribution Pillar in the Henley Factory.
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EARL'S COURT, MARCH 16-20
HENLEY STAND 38
HENLEY
DISTRIBUTION PILLARS
Group 24
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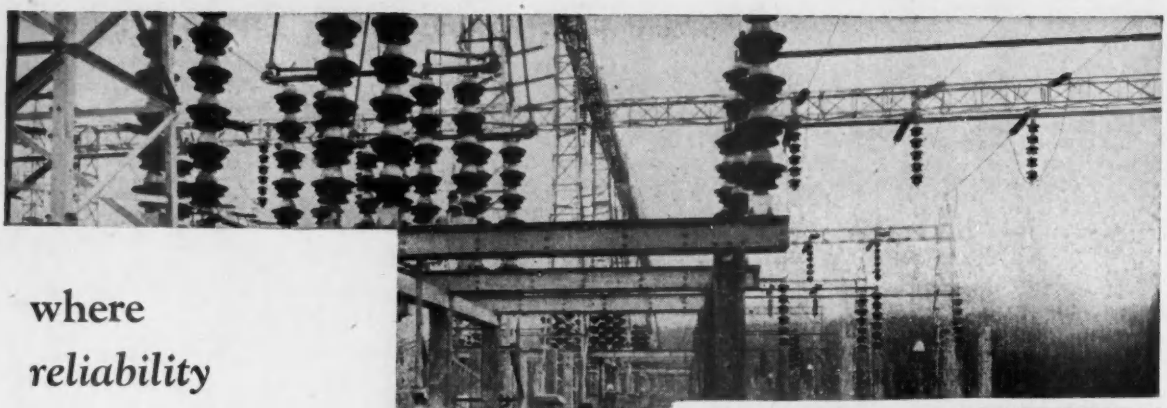

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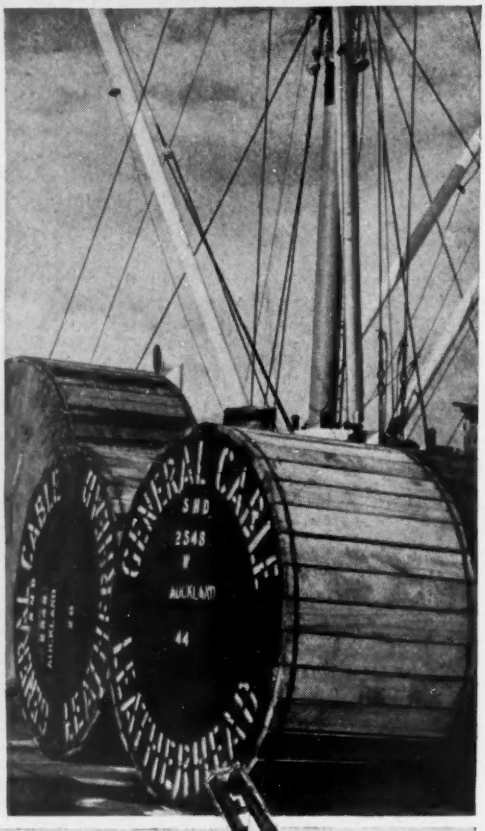

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CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

BOROUGH OF GODALMING
Electrical Installations
Pre-War Houses

TENDERS are invited from Electrical Contractors for the extension of the Electrical Installations of approximately 304 houses at the Farncombe Housing Estates.

The Specification and Schedule of works involved may be obtained from the Borough Engineer and Surveyor, Branksome, Filmer Grove, Godalming.

Tenders must be returned in a plain sealed envelope, endorsed "Electrical Installations," to reach my office not later than 12 noon on Tuesday, 30 Mar., 1954.

The Council do not bind themselves to accept the lowest or any Tender.

R. C. HODGINS,
Municipal Buildings, Town Clerk.
Godalming.
8 Mar., 1954. (H 179)

GOVERNMENT OF KUWAIT

THE Government of Kuwait invite tenders for the supply F.O.B. port country of origin of twenty-five 500 KVA 11/·433 kV Power Distribution Transformers for Phase II of the 11 kV Power Distribution System in Kuwait. Specifications will be available on 16 Mar., 1954, for the submission of tenders by 29 Apr., 1954. Specifications must be obtained from the President of the Department of Electricity, Government of Kuwait, Kuwait, Persian Gulf, and will only be available to accredited Kuwaiti Agents. All further copies of the specifications will be issued by the Consulting Engineers in London at the request of the Government of Kuwait. Notice of the foregoing will be posted on the Notice Board of the Department of Electricity, Kuwait, on the 8 Mar., 1954.

EWBANK AND PARTNERS LTD.,
Engineering Consultants.
10/11 Grosvenor Place,
London, S.W.1. (H 116)

BOROUGH OF SOUTHGATE
Improvement of Street Lighting on Main Roads

TENDERS are invited for the following contracts in connection with the improvement of street lighting to Group A standard on certain main roads within the Borough:

Contract A

Supply only of lanterns and control gear for:

(i) 120 No. 140 watt Sodium Vapour Discharge Lamps.
(ii) 47 No. 250 watt Mercury Vapour Discharge Lamps.

Contract B

Supply and erection of 167 No. Concrete Lamp Standards and fixing 167 No. Lanterns, control gear, wiring, etc.

Separate contract documents will be issued, and contractors may tender for one or both contracts.

Contractors wishing to tender should apply to the Borough Engineer and Surveyor for a copy of the relevant documents.

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Sealed Tenders, in the envelope provided, must be received by the undersigned not later than 9 a.m. on Tuesday, 30 Mar., 1954.

The Corporation reserve the right to let separate Contracts for either (i) 140 watt Sodium Discharge scheme or (ii) 250/400 watt Mercury Discharge Scheme, and do not bind themselves to accept the lowest or any Tender.

GORDON H. TAYLOR,
Town Hall, Town Clerk.
Palmers Green, London, N.13.
4 Mar., 1954. (H 165)

GRAVESEND BOROUGH COUNCIL
Electrical Installation at Central Public Library

TENDERS are invited for the re-wiring of the Central Public Library, Gravesend, and for the supply of certain Electrical Equipment.

Specification and Form of Tender may be obtained from, and the general conditions inspected at the office of the Borough Engineer and Surveyor, 6 Woodville Ter, Gravesend, on receipt of a returnable deposit of one guinea.

The Corporation does not bind itself to accept the lowest or any Tender.

Tenders must be returned to the undersigned not later than Monday, 29 Mar., 1954.

F. W. HARRISON,
4 Woodville Ter. Town Clerk.
Gravesend. (H 178)

GOVERNMENT OF KUWAIT

THE Government of Kuwait invite tenders for the supply F.O.B. port country of origin and supervision of erection of 11 kV Metalclad Switchgear for Phase II of the 11 kV Power Distribution System in Kuwait. Specifications will be available on 16 Mar., 1954, for the submission of tenders by 29 Apr., 1954. Specifications must be obtained from the President of the Department of Electricity, Government of Kuwait, Kuwait, Persian Gulf, and will only be available to accredited Kuwaiti Agents. All further copies of the specifications will be issued by the Consulting Engineers in London at the request of the Government of Kuwait. Notice of the foregoing will be posted on the Notice Board of the Department of Electricity, Kuwait, on 8 Mar., 1954.

EWBANK AND PARTNERS LTD.,
Engineering Consultants.
10/11 Grosvenor Place,
London, S.W.1. (H 166)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
West Perthshire Distribution

TENDERS are invited for the construction of 33 kV, 11 kV and lower voltage wood pole overhead lines in the West Perthshire Area.

Copies of the Tender Document may be obtained from the Engineers, Messrs Kennedy and Donkin, 12 Caxton St, London, S.W.1, on receipt of a deposit of £2. 2s. (returnable).

The Board do not bind themselves to accept the lowest or any tender.

W. D. D. FENTON,
16 Rothesay Ter, Secretary.
Edinburgh, 3. (H 115)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18–64, or a woman aged 18–59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

EASTERN ELECTRICITY BOARD
Fens Sub-Area
Appointment of Demonstrator—Huntingdon

CANDIDATES should have had Domestic training, including electrical housecraft, and should preferably hold the E.A.W. Certificate. They should be competent to plan and give cookery demonstrations, including lectures and advice to consumers on the utilisation of domestic electrical appliances. Previous experience in an Electricity Service Centre is desirable.

The salary will be in accordance with Grade 1 (£400 x £20—£480 x £10—£490) of the National Joint Council Salary Agreement, although progress beyond £440 will be subject to a certificate that the person concerned is capable of undertaking all the duties of the grade. Future salary and conditions of service will be in accordance with agreements made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a superannuation scheme, and may be required to undergo a medical examination.

Applications by letter, stating age, education, qualifications and experience, with details of present appointment and salary, should be submitted to the manager, Fens Sub-area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, within fourteen days of the appearance of this advertisement. (H 154)

EASTERN ELECTRICITY BOARD
Essex Sub-Area
Vacancies—Jointers, Southend District

APPLICATIONS are invited for three positions as Jointers in the Southend District.

The rate of pay, at present 3s. 6d. per hour for a 44 hour week, and conditions of service will be in accordance with the National Joint Industrial Council Agreement for the Electricity Supply Industry.

Applications by letter, stating age, experience and present employment should be submitted to the District Manager, Southend, Eastern Electricity Board, 85 London Rd, Southend, Essex, within fourteen days of the appearance of this advertisement. (H 152)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ENGINEERING DRAUGHTSMAN (ARCHITECTURAL) required in the No. 1 Sub-Area Engineer's Department, 24 Hatton Garden, Liverpool 3. Salary £433/£567 p.a. (N.J.B., Schedule "D," Grade 6).

Applicants should have some experience of general building work, including reinforced concrete structures and foundations, and have obtained the O.N.C. in Building or a similar qualification.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, above address. Closing date: 22 Mar., 1954. (H 141)

BRITISH ELECTRICITY AUTHORITY
South East Scotland Division

REQUIRE SHIFT CHARGE ENGINEER for Dunfermline Power Station.

Applicants should preferably have experience in operation of turbo-generators, water tube boilers and H.T. electrical plant. A knowledge of alternating current is advisable. Certificated marine engineers would be considered.

Salary £599/£622 (N.J.B. Class C/7) Pension Scheme.

Apply in writing by 20 Mar., 1954, stating age and experience to Divisional Controller, British Electricity Hse, Portobello, Midlothian. (H 148)

YORKSHIRE ELECTRICITY BOARD
No. 5 (Wakefield) Sub-Area

Doncaster District
THIRD ASSISTANT DISTRICT ENGINEER

APPLICANTS must have had a sound practical training and considerable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary—N.J.B. Class F, Grade 9, £607/£629 per annum.

Sub-Area Headquarters
GENERAL ASSISTANT ENGINEER (DISTRIBUTION DESIGN)

Applicants must hold at least the Higher National Certificate in Electrical Engineering and should have had some experience in the planning of overhead and underground distribution systems and the design of high voltage substations. Experience in the preparation of reports, load estimates and capital budgets is desirable.

Salary—N.J.B. Class K, Grade 13, £583/£605 per annum.

Castleford District
THIRD ASSISTANT DISTRICT ENGINEER

Applicants must have had a sound practical training with experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Applicants must hold a current driving licence, be prepared to reside in the district and undertake standby duties.

Preference will be given to those who are Corporate Members of the Institution of Electrical Engineers or who hold equivalent qualifications.

Salary—N.J.B. Class E, Grade 9, £587/£600 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 25 Mar., 1954.

No. 3 (Sheffield) Sub-Area

Mexborough District
GENERAL ASSISTANT DISTRICT ENGINEERS (2 posts)

Applicants should have a good general and technical education up to Higher National Certificate standard with practical training in an engineering workshop or in the Electricity Supply Industry. Some experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution is necessary. Candidates should be prepared to reside in the district.

Salary—N.J.B. Class E, Grade 11, £524/£540 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 25 Mar., 1954. (H 136)

MIDLANDS ELECTRICITY BOARD

BIRMINGHAM and District Sub-Area, require a SENIOR DRAUGHTSMAN in the Sub-Area Engineer's Department. Applicants should have sound experience in the preparation of engineering drawings required for the construction and operation of Transmission and Distribution Networks and their associated substations. Knowledge of surveying and mains record routine will be considered an additional qualification. Salary £567/£671 (N.J.B. Schedule "D," Grade 5). Superannuable.

Apply within fourteen days stating age, experience, salary and present position to Sub-Area Manager, Midlands Electricity Board, Birmingham and District Sub-Area, 14 Dale End, Birmingham 4. A. STEPHENS, Secretary. (H 153)

MIDLANDS ELECTRICITY BOARD
Control Engineer—Worcester and District Sub-Area

A CONTROL Centre is to be set up at Sub-Area Headquarters, Worcester, to control the 66 kV, 33 kV Transmission and associated Distribution Systems in the Sub-Area, and part of those systems in the Shropshire and Herefordshire Sub-Area.

Applications are invited for the position of Second Assistant Engineer (Control) with responsibility to a Sub-Area Senior Assistant Engineer for the operation of the systems in the area specified.

Applicants should have good knowledge and experience of protection and system loading. Salary £869/£907 per annum (N.J.B. Class "K," Grade 7). Superannuable.

Apply in writing within 14 days stating age, experience, present position and salary to Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

Shift Control Engineers—South Staffs and North Worcs Sub-Area

Applications are invited for appointments as Third Assistant Engineer (Shift Control) in the South Staffs and North Worcs Sub-Area. The appointments are for duties at a Sub-Area Control Centre being established at Ocker Hill, Tipton, Staffs. Salary £808/£833 per annum (N.J.B. Class "M," Grade 10). Superannuable.

The successful applicants will be responsible to the Control Engineer for directing and supervising District and Sub-Area Staffs in the operation of the Transmission and Distribution systems within the Sub-Area. Applicants should have good knowledge of system operation and loading. Experience in the operation of Supervisory Controlled Sub-Stations would be an advantage.

Apply in writing within 14 days stating age, experience, present position and salary to Sub-Area Manager (Ref. CW), Midlands Electricity Board, Toll End Rd, Tipton, Staffs.

A. STEPHENS,
Secretary.
(H 150)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

GENERAL ASSISTANT ENGINEER, CONSTRUCTION DEPARTMENT, SOUTH STAFFS & NORTH WORCS SUB-AREA

The successful applicant will be required to examine drawings and check technical details of schemes submitted by contractors and generally assist in the Department. Salary £661/£681 per annum. (N.J.B. Class "M," Grade 13). Apply, in writing, within 14 days, stating age, education, qualifications, experience, present position and salary to Sub-Area Manager, Midlands Electricity Board (Ref. CW), Toll End Rd, Tipton, Staffs.

SALES REPRESENTATIVE (MALE), CENTRAL GLOUCESTERSHIRE SUB-AREA

Applicants should be competent to advise consumers on matters concerning supply, tariffs, apparatus sales, wiring and installation thereof and in particular Water Heating. Salary £380/£470 per annum (N.J.C. Grade 1) or £460/£520 per annum (N.J.C. Grade 2), dependent upon qualifications and experience, present position and salary to District Manager, Midlands Electricity Board, Commercial Rd, Gloucester.

A. STEPHENS, Secretary. (H 140)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

COMMERCIAL ASSISTANT (Technical) required in the No. 4/5 Sub-Area based on Penmaenmawr.

Salary £524/£540 per annum (N.J.B. E.11.)

Applicants should have an engineering training, experience in dealing with installation work, consumers' supply enquiries and general commercial duties.

The appointment is superannuable and subject to medical examination.

Standard application forms obtainable from the Manager, No. 4/5 Sub-Area, Electricity House, Rhostyllen, Nr. Wrexham.

Closing date: 22 Mar., 1954. (H 137)

BRITISH ELECTRICITY AUTHORITY
South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. appointments at:

TRANSMISSION SECTION OFFICE, CARMARTHEN BAY POWER STATION, NR. BURRY PORT

Vacancy No. 20/1

THIRD ASSISTANT ENGINEER (Section). AX/CX. Grade 4, £763/£949 per annum. Qualifications not less than those required for Corporate Membership of the Institution of Electrical Engineers; considerable experience in the administration of a Transmission Section and in operation, repair and maintenance of 132 kV overhead lines, underground cables and substation equipment.

Vacancy No. 20/2

GENERAL ASSISTANT ENGINEER (Section). AX/CX. Grade 8, £501/£675 per annum. H.N.C. (Electrical) and practical experience on H.V. substation and lines. Experience on 132 kV equipment advantageous.

Closing date—22 Mar., 1954.

Vacancy No. 21/1

STATION SUPERINTENDENT, Cardiff Power Station. Salary Grade F.1 (£1,087/£1,134).

Vacancy No. 21/2

STATION SUPERINTENDENT, Llynfi Power Station. Salary Grade G.1 (£1,158/£1,209).

Applicants should preferably be Corporate Members of the Institution of Mechanical and/or Electrical Engineers, and have had considerable experience in the operation, maintenance and administration of a modern generating station, including (for the Llynfi appointment) experience of pulverised fuel.

Both positions will become vacant in June, 1954.

Closing date—29 Mar., 1954.

Vacancy No. 22/1

UPPER BOAT POWER STATION. STATION SHIFT CONTROL ENGINEER. Salary H.10. £641/£667 per annum.

Vacancy No. 22/2

LLYNFI POWER STATION. STATION SHIFT CONTROL ENGINEER. Salary G.10. £608/£630 per annum.

Vacancy No. 22/3

NEWPORT POWER STATION. STATION SHIFT CONTROL ENGINEER. Salary F.10. £577/£598 per annum.

H.N.C. and experience in Power Station Control Room desirable.

Closing date—22 Mar., 1954.

Application forms obtainable from Secretary, South Wales Division, British Electricity Authority, Twyn-y-fedwen Rd, Gabalfa, Cardiff. (H 168)

BOROUGH OF EDMONTON
Electrical Assistant Borough Architect's Dept.

THE Council require a suitably qualified ELECTRICAL ASSISTANT to take charge of the electrical section of the Borough Architect's Department. Applicants must have had sound experience in practical installations, controlling labour, organising routine maintenance, supervising contracts, designing installations and estimating.

Grade APT.V/Va £620 by 2 x £15 and 3 x £20 to £710 plus London weighting £10—£30 according to age. 44 hour week.

Applications on forms from Town Clerk, Town Hall, Edmonton, must be delivered by 25 Mar., 1954. (H 142)

BRITISH ELECTRICITY AUTHORITY
North Western Division

VACANCY No. 21/54 — MAINTENANCE ENGINEER (Mechanical) at Agecroft H.P. Generating Station, nr. Manchester. Salary £787/£818 (G.6). It is expected that the station will have an ultimate capacity of 345 MW. Previous applicants need not re-apply.

Vacancy No. 38/54—STATION SHIFT CONTROL ENGINEER, Rawtenstall Generating Station. Salary £502/£521 (C.10).

Applications, quoting Vacancy No., to Establishments Officer, British Electricity House, 825 Wilmslow Rd, Manchester 20, before 20 Mar. (H 113)

BRITISH ELECTRICITY AUTHORITY
Merseyside and North Wales Division

APPLICATIONS are invited for the appointment of FIRST ASSISTANT CHEMIST at the Connah's Quay Power Station, North Wales. Salary £641/£667 per annum N.J.B. Class G, Grade 9. Superannuable and subject to medical examination.

Applicants should have experience in modern power station laboratory work covering the analysis of water, fuel and oil. Possession of a university degree, A.R.I.C. or equivalent qualification is desirable.

Application Forms from the Divisional Secretary, Beaconsfield Rd, Woolton, Liverpool. Closing date 31 Mar., 1954. (H 112)

SOUTH EAST SCOTLAND ELECTRICITY BOARD
Lothians Sub-Area

THIRD ASSISTANT ENGINEER required in the Planning and Technical Section at Sub-Area Headquarters, Musselburgh.

The duties include the commissioning and testing of protective gear, the calculation of relay settings and fault powers and the high voltage testing of cables and switchgear. Experience in the operation of supervisory equipment involving telephone type equipment would be an advantage. Technical Education to the Higher National Certificate standard is essential. N.J.B. Class G, Grad. 10, £608/£630 per annum. Superannuation Scheme.

Application, by letter, stating age, education, qualifications and experience with details of present appointment and salary should be submitted to the Sub-Area Manager, South East Scotland Electricity Board, High Street, Musselburgh, within fourteen days. (H 114)

BRITISH ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following posts:

JUNIOR ENGINEERS
RYE HOUSE GENERATING STATION

Salary Class G, Grade 16, £402—Grade 14, £491 per annum.

Duties include assisting in the Electrical Control Room and experience in the technical operation of electrical, boiler house and turbine house plant, testing, etc., in a Generating Station and provide a suitable basis for promotion to higher technical grades.

Previous experience in a Generating Station and/or technical training to the standard of the Ordinary National Certificate or its equivalent will be of advantage.

Applications stating age, qualifications and experience should be sent to The Controller, British Electricity Authority, Eastern Division, Northmet Hse, Southgate, N.14, by 20 Mar., 1954.

W. N. C. CLINCH,
Controller.
(H 145)

BRITISH ELECTRICITY AUTHORITY
North Western Division

VACANCY No. 28/54—MAINTENANCE ENGINEER (Electrical), Barton Generating Station, near Manchester. Salary £833/£866 (H.6).

Apply, quoting vacancy No. to Establishments Officer, British Electricity Hse, 825 Wilmslow Rd, Manchester 20, before 20 Mar., 1954. (H 149)

BRITISH ELECTRICITY AUTHORITY
Yorkshire Division

APPLICATIONS are invited for the following apointments:

ASSISTANT ENGINEER,
EFFICIENCY AND TESTING DEPARTMENT,
DIVISIONAL HEADQUARTERS

Salary £818/£1,036 per annum, Grade 3, Class AX/DX, National Joint Board Agreement (Schedule C).

Applicants should be educated to B.Sc. or equivalent standard and should be thoroughly experienced in the operation of a modern high pressure Power Station, particularly with regard to the operation of P.F. boilers.

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The appointment will be based on Skelton Grange Power Station and the successful applicants will be required to divide his time between Skelton Grange and Keadby Power Stations.

STATION CHEMIST,
NEEPSEND POWER STATION, SHEFFIELD

Salary £772/£802 per annum. Class H, Grade 7, National Joint Board Agreement (Schedule A).

Applicants should hold a Higher National Certificate in Chemistry or its equivalent. Experience in power station practice is required involving the chemical control of H.P. boilers, fuel sampling and analysis and oil testing. A knowledge of chemical power station formulas and sound analytical experience is desirable.

MAINTENANCE ENGINEER (MECHANICAL),
KIRKSTALL POWER STATION, LEEDS

Salary £772/£802 per annum. Class H, Grade 7, National Joint Board Agreement (Schedule A).

Applicants should have a sound technical education and experience in the operation and maintenance of modern boiler plant fired by pulverised fuel. Preference will be given to candidates who are Corporate Members of the Institution of Mechanical Engineers, or who hold equivalent qualifications.

(a) MECHANICAL DRAUGHTSMEN, (b) ELECTRICAL DRAUGHTSMEN in the GENERATION CONSTRUCTION DEPARTMENT at ROTHERHAM and LEEDS

Candidates for (a) should have experience in one or more of the following:

(i) Design and layout of power station equipment.
(ii) H.P. and L.P. steam and feed pipework, condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

Candidates for (b) should have experience in the preparation of layouts and diagrams for the installation of switchgear, transformers, cabling, wiring and general power station electrical plant.

The salary will be in accordance with the National Joint Board Agreement (Schedule D) Grade 5, £567/£671 per annum (Senior Draughtsmen) and Grade 6, £433/£567 per annum (Engineering Draughtsmen) according to qualifications and experience.

Applications on Forms A.E. 6/ACT, obtainable from the Divisional Secretary (Establishments), British Electricity House, St. Mary's Rd, Leeds, 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(H 151)

BRITISH ELECTRICITY AUTHORITY
Midlands Division

DEPUTY POWER STATION SUPERINTENDENT is required for both Nechells "A" and "B" Power Stations, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule "A," Grade K3, commencing at £1,182 per annum.

Candidates should preferably possess a university degree in engineering or be corporate members of the Institutes of Mechanical and/or Electrical Engineers. A wide knowledge of the operation of a large generating station and good administrative ability are essential.

Apply on form AE6, quoting Vacancy No. 623MD, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 27 Mar., 1954. (H 143)

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Principal: H. BAKER, PH.D., A.M.I.C.E., A.M.I.MECH.E.

APPLICATIONS are invited for the post of ASSISTANT LECTURER, Grade A, in Electrical Engineering. Must be able to teach to final City and Guilds standard in "Regulations" and "Installations Technology." Ability to teach Electrotechnology and other electrical subjects to Ordinary National Certificate standard would be an advantage.

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Salary scale at present £415 x £18—£670 per annum, with a further £60 for graduate or equivalent qualification and up to 3 increments of £18 each for approved periods of training. Regard may be paid to approved industrial experience when assessing the commencing salary.

Application forms, together with further particulars, may be obtained from the Registrar, Nottingham and District Technical College, Shakespeare St, Nottingham, to whom they should be returned not later than 2 Apr., 1954.

F. STEPHENSON,
Clerk to the Joint Education Committee.
(H 144)

STATION SHIFT CONTROL ENGINEER
Littlebrook Power Station

APPLICANTS, who should preferably possess Higher National Certificate in Electrical Engineering, must have had experience in the operation and control of turbo-generators and in control room duties connected with inter-connected generating systems and E.H.T. feeder network. N.J.B. Conditions of service and salary, Class M, Grade 10, £848. 8s. p.a. Applications giving details of education, present position, experience, etc., should be received by Station Superintendent, Littlebrook Power Station, near Dartford, Kent, by 22 Mar., 1954. (H 169)

BRITISH ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. for posts (*a*) and Corporate Membership for post (*b*) an advantage.

DEPUTY STATION SUPERINTENDENT—BANKSIDE GENERATING STATION 54/154

Applicants should have had experience of maintenance and operation of high pressure steam plant, possess knowledge of Station costs, and ability to organise and programme Station work. Salary—Class H, Grade 3= £1,085 per annum.

ASSISTANT ENGINEER (EFFICIENCY & TESTING)—WEST HAM GENERATING STATION 54/155

Applicants should have had a good technical education and experience in the investigation of the technical problems of Power Station operation. A knowledge of plant testing and operating statistics is desirable. The duties will include keeping check on all matters associated with the thermal efficiency of the station. Salary—Class H, Grade 11= £637. 7s. per annum.

JUNIOR ENGINEERS—CHEMISTRY DEPARTMENT 54/156

Applicants required for general duties in Division. In the first instance they will be required to serve for a period on work in connection with non-destructive methods of testing metals associated with boilers, steam pipes, etc., and will ultimately proceed to a more general type of training in Power Station operation or maintenance. Salary—Class AX, Grade 9=£415/£551. 5s. per annum.

Application, quoting vacancy number, may be made on form obtainable from Divisional Secretary, B.E.A., London Division, Generation House, Great Portland St, W.1, and be received within 14 days of this advertisement. (H 138)

KENSINGTON BOROUGH COUNCIL

REQUIRE ASSISTANT LIGHTING SUPERINTENDENT. Salary £550/£625 plus London Weighting. No housing provided. N.J.C. conditions. Previous experience required in modern methods of street lighting, design and installation of interior house lighting, and maintenance of electrical and gas equipment. The position of Lighting Superintendent will become vacant within the next few years. Applications stating age, qualifications, experience, with names of two referees, to reach Town Clerk, Town Hall, Kensington, W.8, by 23 Mar., 1954. (H 174)

BRITISH ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

ENGINEERING DRAUGHTSMEN (CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 1/54

Candidates should have experience in design and detail of reinforced concrete structures, piled and slab foundations for heavy plant, culverts, cable subways, etc., for general building construction drainage and sanitation schemes, associated with official and administrative buildings.

The salary will be in accordance with Grade 5 (£567/£671 per annum) or Grade 6 (£433/£567 per annum) of Schedule D of the National Joint Board Agreement.

ENGINEERING DRAUGHTSMEN
(MECHANICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 2/54

Senior Draughtsmen are required in the Mechanical Section of the Construction Department at North Wilford Power Station. Candidates should have experience in one or more of the following:

(i) Design and layout of Power Station equipment, including turbo-alternators, boiler plant, coal and ash plant, and general station auxiliaries.
(ii) H.P. and L.P. steam and feed pipework. Condensing plant and feed heating systems.
(iii) Conveyor plant, coal handling systems and material handling of station auxiliary equipment.

The salary will be in accordance with the National Joint Board Agreement Grade 5 (£567/£671 per annum) and Grade 6 (£433/£567 per annum) of Schedule D according to experience.

ENGINEERING DRAUGHTSMEN
(ELECTRICAL)
CONSTRUCTION DEPARTMENT
Vacancy No. 3/54

Candidates should have experience in the preparation and layouts and diagrams for the installation of E.H.T. and L.T. Switchgear, transformers, E.H.T. and L.T. cables: knowledge of protective gear systems would be an advantage.

The salary will be in accordance with the National Joint Board Agreement Grade 5 (£567/£671 per annum) and Grade 6 (£433/£567 per annum) of Schedule D according to experience.

SHIFT CHARGE ENGINEER
DERBY POWER STATION
Vacancy No. 27/54

Applicants must have had a sound technical training and considerable experience in a modern Generating Station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers or who hold similar qualifications, and knowledge of Pulverised Fuel Firing will be an advantage.

The salary will be in accordance with Class F, Grade 7 (£697/£718 per annum) of the National Joint Board Agreement.

The closing date for receipt of applications is 18 Mar., 1954.

STATION SHIFT CONTROL ENGINEERS
DRAKELOW POWER STATION
Vacancy No. 28/54

The minimum requirements are possession of the Higher National Certificate in electrical and/or mechanical engineering, together with experience in the control and load despatching of large capacity steam generating plant connected to the National Grid System.

Salary in accordance with Class J, Grade 10 (£680/£706 per annum) of the National Joint Board Agreement.

The closing date for receipt of applications is 26 Mar., 1954.

DEPUTY POWER STATION SUPERINTENDENT
DRAKELOW POWER STATION
Vacancy No. 29/54

Applicants should be corporate members of the Institution of Mechanical and/or Institution of Electrical Engineers, and have had experience in a responsible position with the operation and maintenance of modern large capacity high pressure plant employing pulverised fuel boilers.

The successful applicant should also possess sound administrative and organising ability.

Salary in accordance with N.J.B.

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Schedule, Class J, Grade 3 (£1,104/£1,156 per annum).

The closing date for this appointment is 26 Mar., 1954.

SENIOR ASSISTANT—INTERNAL AUDIT
Vacancy No. 30/54

Applications are invited for the appointment of Senior Assistant, Internal Audit, based at Nottingham.

Candidates should preferably have a recognised Accountancy qualification.

The salary for the appointment will be within Grade 4 (£605/£665 per annum) of the National Joint Council Agreement.

The closing date for receipt of applications is 18 Mar., 1954.

THIRD ASSISTANT ENGINEER
(MECHANICAL)
CONSTRUCTION DEPARTMENT,
NORTH WILFORD POWER STATION
Vacancy No. 35/54

Applicants should have had fundamental training in mechanical engineering, including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in modern power stations. Candidates should possess a University Degree or equivalent qualification in mechanical engineering.

The duties of this position will be the supervision of the installation of plant at North Wilford Power Station.

The salary for this appointment will be within Class AX/DX, Grade 5, Schedule C (£649/£858 per annum) of the National Joint Board Agreement.

The closing date for this appointment is 26 Mar., 1954.

SHIFT CHARGE ENGINEER
STAYTHORPE POWER STATION
Vacancy No. 36/54

Applicants must have had a sound technical training and considerable experience in a modern generating station. Preference will be given to candidates who are Corporate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications.

The salary will be in accordance with Class J, Grade 7, of the National Joint Board Schedule (£817/£852 per annum).

A house will be available for the successful applicant.

The closing date for receipt of applications is 26 Mar., 1954.

The above positions will be pensionable within the provisions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.
(H 147)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER

Swale District

SALARY £665 to £688 per annum under N.J.B. Class D, Grade 6. Superannuable. Applicants should be suitably qualified and have had experience in all aspects of a Commercial Department including contracting, the preparation of estimates, showrooms, and the application of electricity to farms. Experience in connection with DC/AC changeover schemes would be an advantage.

Applications giving 2 referees, must reach F. E. Fairbank, A.I.E.E., District Manager, Swale District, 88a High St, Sittingbourne, by 22 Mar., 1954.

Maidstone District

DEMONSTRATOR (FEMALE)

Salary £400 x £20 £480 x £10— £490 p.a. under the N.J.C. Grade 1. Superannuable. Preference to applicants in possession of a recognised diploma or certificate in domestic science and the E.A.W. certificate. The person appointed will be required to conduct lectures and demonstrations, advise consumers and generally assist in showrooms.

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Applications, stating age, experience and giving the names of 2 referees should reach E. E. Pope, M.I.E.E., District Manager, SEEboard, Fairmeadow, Maidstone, by 24 Mar., 1954.

Eastbourne District

ELECTRICIAN

Wages 3s. 8d. per hour for 44 hour 5 day week under N.J.I.C. Agreement. Knowledge of refrigerator maintenance and repairs an advantage.

Applications stating age and experience and giving the names of 2 referees must reach J. E. Winborne, District Manager, SEEBoard, Electric Hse, Grove Rd, Eastbourne, by 24 Mar., 1954.

A. L. BURNELL,
Secretary.
(H 146)

BRITISH ELECTRICITY AUTHORITY

GENERATION Construction Sub-Department, Headquarters, London, require a PRINCIPAL ASSISTANT ENGINEER (Co-Ordination) to supervise engineers co-ordinating Power Station construction work in several Divisions. Duties include visits to Power Stations and attendance at site meetings. Practical experience in Modern Power Station construction, including handling of contracts, preparation of commissioning programmes, work on site and co-ordination of projects from inception to commissioning is essential. Candidates should preferably be Corporate Members of the I.E.E. or I.Mech.E. Salary N.J.M. Scale 4, £1,650/£1,800 including London Allowance.

Applications stating age, qualifications and experience, present position and salary to D. Moffat, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, by 2 Apr., 1954. Quote reference 463. (H 175)

SOUTHERN ELECTRICITY BOARD
Demonstrator

GREENFORD District of No. 1 (Southall) Sub-Area. Salary N.J.C. Grade 1 (£400/£490 per annum, plus London Weighting). N.J.C. Conditions of Service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, and to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

The successful candidate will be required to contribute to the B.E.A. and Area Board's Superannuation Scheme, if eligible.

Applications on forms obtainable from the SUB-AREA SECRETARY, 2-6 Windmill La, Southall, and returned to him not later than 25 Mar., 1954. (H 139)

GOVERNMENT OF KUWAIT

JUNIOR SHIFT ENGINEERS required for service with the Government of Kuwait, Persian Gulf. Their services are required for a new Steam Power Station and a Water Distillation Plant. They will be required to work on shift under the Shift Charge Engineers. Applicants must have experience in Steam Power Station operation and have some technical qualification. Applicants should not be more than 35 years of age. The starting consolidated salary offered is at the rate of £1,500 per annum. Free furnished quarters and free medical attention are provided. The first year will be probationary and subject to satisfactory service this contract may be extended by another two years. Married accommodation cannot be promised under one year. Applications in the first instance, stating qualifications, training and experience, to be addressed to the Secretary, EWBANK AND PARTNERS LIMITED, Engineering Consultants, 10/11 Grosvenor Place, London, S.W.1. (H 167)

DRAUGHTSMAN. Age 23-28. Experience of Electrical Switchgear or Accessory Development work. Five day week. Office situated 10 mins. Birmingham City Centre. State experience, age, and salary required.—Box No. 3373, Electrical Times. (H 159)

AIR MINISTRY require MECHANICAL and ELECTRICAL ENGINEERS in Works Department for design, operation and maintenance of mechanical and electrical services on R.A.F. stations at home and overseas and Civil Aviation stations. Appointments in two grades (*a*) Main Grade, salary scale £1,000 to £1,320, (*b*) Assistant Grade, £650 to £1,000. Starting pay according to qualifications and experience. Salaries somewhat lower in provinces. Candidates should be age 25 or over. Appointments temporary and non-pensionable but with long term possibilities. Special allowance up to £1,300 a year according to location payable in addition to salary during overseas service. Candidates must be natural born British subjects of natural born British parents.

MINIMUM qualifications and experience for both grades of posts:

(i) (*a*) University degree or equivalent diploma in electrical and/or mechanical engineering and at least a two year apprenticeship or (*b*) Graduate or Corporate Membership of the Institutions of Mechanical or Electrical Engineers with appreciable electrical engineering experience and at least three years' apprenticeship, and (ii) employment in responsible position for minimum of three years with well established engineering concern providing wide experience in electrical and mechanical engineering practice.

Application forms quoting reference D1/54a from M.L. and N.S., Technical and Scientific Register (K), Almack Hse, King St, London, S.W.1. (H 135)

A BIRMINGHAM wholesaler, old established, E.W.F. and R.W.F., requires ELECTRICAL REPRESENTATIVE to call on large users and contractors. Pension and Life Assurance scheme. Car provided or allowance paid. Write stating salary required and past experience to—Box No. 3357, Electrical Times. (H 129)

APPLICATIONS are invited for the posts of OVERHEAD LINESMEN to be located in the Drakelow Area. Experience of 132 kV steel tower lines essential. Conditions and wages in accordance with N.J.I.C. Schedule. Applications, stating age, experience, etc., should be submitted through Ministry of Labour, to Divisional Establishments Officer, BRITISH ELECTRICITY AUTHORITY, Barker Gate, Nottingham. Please quote Vacancy No. 9/54. (H 107)

APPLICATIONS are invited for the posts of OVERHEAD LINESMEN to be located at a Transmission Section near Coventry. Experience of 132 kV Steel tower lines essential. Conditions and wages in accordance with N.J.I.C. Schedule. Applications, stating age, experience, etc., should be submitted through Ministry of Labour to Divisional Establishments Officer, BRITISH ELECTRICITY AUTHORITY, Barker Gate, Nottingham. Please quote Vacancy No. 34/54. (H 108)

APPLICATIONS are invited by the ENGLISH ELECTRIC CO., LTD., for ENGINEERS having wide experience in the preparation of comprehensive and specialised schemes of machine control. Applicants must be of Higher National Certificate standard and capable of preparing schemes in detail. Apply quoting ref. 1244A to Dept. C.P.S., 336/7 Strand, W.C.2. (H 102)

AN Electrical Engineering firm in South London require an engineer for their Transformer Sales Office. Ordinary National Certificate in Electrical Engineering standard. Apply in writing stating age, experience and qualifications.—Box No. 3337, Electrical Times. (H 67)

ASSISTANT to Works Manager of small factory making electrical heating appliances in Woodford. Applicant should have ordinary national certificate in electrical engineering, or similar, and should preferably have completed National Service. Write giving age, full particulars of experience and salary required to—Box No. 3341, Electrical Times. (H 96)

A VACANCY exists with a firm of Cable Makers for a young electrical Engineer of H.N.C. or degree standard who has completed his apprenticeship and who has a leaning towards the commercial side. Apply with brief details of career to—Box No. 3325, Electrical Times. (H 2)

BRITISH ELECTRICITY AUTHORITY, Research Laboratories, Leatherhead, require a JUNIOR ENGINEER for testing, development and research work in the Laboratories and in the field, in connection with the generation of electricity. Candidates should have a H.N.C. or equivalent qualification in Electrical or Mechanical Engineering or in Physics. Salary N.J.B. Grade 6, £390/£606. Forms from D. MOFFAT, Director of Establishments, British Electricity Authority, Winsley St, London, W.1, to be returned by 29 Mar., 1954. Quote reference ET/461. (H 134)

COLLIERY ELECTRICIAN required by the NIGERIAN COAL CORPORATION for 1 tour of 18 months in the first instance with prospect of renewal. Salary etc. £890 rising to £1,040 a year. Gratuity of £100/£150 a year. Outfit allowance £60. Free passages for officer and wife. Assistance towards cost of children's passages or grant up to £150 annually for maintenance in U.K. Liberal leave on full salary. Candidates must have served an appropriate apprenticeship and should subsequently have had some years experience in the operation, installation and maintenance of Colliery electrical plant. They should be experienced in all branches of Colliery electrical work including H.T. and L.T. systems, electrically operated coal cutters, conveyors, drilling equipment and pumping and haulage plant. Preference will be given to candidates holding a certificate of the Association of Mining Electrical Engineers. Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30432/EE. (H 104)

CONTRACTS ENGINEER required to handle tenders and contracts for switchgear up to and including 33 kV equipment, and thoroughly experienced in associated protective and control schemes. Knowledge of export procedure would be an advantage. Applications giving full details of past experience and salary required to be addressed to The Personnel Manager, SOUTH WALES SWITCHGEAR LTD., Blackwood, Mon. (H 122)

CONSULTING Engineers in London require Engineer for preparation designs, drawings and specifications for transmission line projects; salary according capabilities and experience. Also Draughtsman for preparation designs, drawings and specifications for lighting and power installations, minimum age 25, salary not less than £625/annum. Apply with full particulars to—Box No. 3335, Electrical Times. (H 66)

CONSUMERS ENGINEERS M2C/30379/EE, ASSISTANT CONSUMERS ENGINEER M2C/30380/EE, required by the Government of Aden Electricity Department for one tour of 18/24 months with prospects of permanency. Salary in scale £1,494 rising to £1,662, and £930 rising to £1,452 a year respectively. Outfit allowance £60. Free passages. Furnished Government quarters available at moderate rental. Liberal leave on full salary. Consumers Engineer: Candidates possessing H.N.C. or equivalent should have had considerable experience in the Consumers branch of a Public Electricity Undertaking and should be able to deal with the administrative details and routine entailed. Experience in meter testing and organisation would be an advantage. Assistant Consumers Engineer: Candidates with O.N.C. or equivalent should have had experience in a similar post of a Public Supply Authority. Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30379/EE or M2C/30380/EE. (H 170)

DIESEL-ELECTRIC MECHANICS required by the FALKLAND ISLANDS DEPENDENCIES SURVEY for service in the Antarctic for a tour of 18 or 30 months in the first instance. Salary in scale £330 rising to £440 a year. Free passages, quarters, subsistence, clothing and liberal canteen stores; it is possible to save almost all emoluments. Liberal leave on full salary. Candidates between 20—26 years must have a general working knowledge of electricity and be capable of running and maintaining small diesel generating sets with associated switchboards, accumulators, etc.

Write to the Crown Agents, 4 Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience and quote M2C/30413/EE. (H 103)

DRAUGHTSMEN. IGRANIC ELECTRIC CO. being desirous of increasing the size of its Control Gear Drawing Office invites application for positions as senior and junior draughtsmen. Apply to Chief Engineer, IGRANIC ELECTRIC CO., LTD., Bedford. (H 106)

DRAUGHTSMAN required for London Office, engaged on Overhead Transmission Line work. Duties include preparation of general arrangement and detail drawings of supporting structures, etc. Pension Fund. Staff Canteen. 5-day week. Salary according to qualifications and experience. Apply in writing to Staff Officer, BRITISH INSULATED CALLENDER'S CONSTRUCTION COMPANY LIMITED, 30 Leicester Sq, London, W.C.2. (H 120)

DRAUGHTSMAN required. Experienced in electrical installation planning, switchgear, power distribution and wiring. Radio knowledge not essential. Write stating age, experience and salary required to Dept. C.P.S., Marconi House, 336/7 Strand, W.C.2, quoting ref. 164C. (H 4)

ELECTRICAL ENGINEER required for Electrical Department of Works in the North-East. Should have a sound practical training, drawing office experience, a knowledge of motor control gear resistor calculations, and preferably some experience of electrical heating for industrial applications. Apply giving full details of experience, technical qualifications, age, whether married or single, and salary required to—Box No. 3349, Electrical Times. (H 119)

ELECTRICAL Research Association—A Technical Assistant is required for research work on Wind-Driven Electric Generators at the E.R.A. Windmill Testing Station at Cranfield, Nr. Bedford. Applicants should have qualifications in Engineering or Physics. Experience of Strain-Gauge Technique would be an advantage. Salary range £550/£650 per annum according to age and qualifications. Applications should be made to The Director, THE ELECTRICAL RESEARCH ASSOCIATION, Savoy Place, London, W.C.2. (H 155)

ELECTRICAL Engineer, aged under 35, with some years' industrial experience and holding H.N.C., required for training as ASSISTANT CORROSION ENGINEER by large Oil Company in Middle East. Substantial emoluments, pension fund, paid home leave. Bachelor preferred, as married man would have to be prepared for initial separation. Write quoting No. 434 to Box No. 7471, c/o CHARLES BARKER AND SONS LTD., 31 Budge Row, London, E.C.4. (H 133)

ELECTRICAL Contracting. Estimating and Supervising ENGINEER required by old established firm, Westminster. Applicants should have had a thorough practical and technical training together with installation design and estimating experience; will consider up-grading capable men lacking only Estimating experience.

Salary in accord with ability and experience, Pension Schemes.

Applicants to give age, qualifications and details of experience, etc., and salary required.—Box No. 3361, Electrical Times. (H 131)

EXCEPTIONAL opportunity occurs for capable DESIGNER-DRAUGHTSMAN. Well-known manufacturers of Control Gear now engaged upon large expansion programme require the services of fully-qualified man with knowledge of Drum Controllers, Automatic Contractors, Limit Switches, etc. The post offers unusual opportunities to keen man, capable of bringing original ideas to a responsible position, with terms and salary in complete accord with position offered. Write in confidence to—Box No. 3345, Electrical Times. (H 101)

ELECTRICAL ENGINEERS. McLellan and Partners, Consulting Engineers, have a few vacancies for young engineers interested in industrial work. Applicants must have a degree, or equivalent, and be trained by one of the larger electrical manufacturers. Reply to 32 Victoria St, London, S.W.1. (H 51)

FUSEGEAR Sales/Contracts Engineer is required by THE ENGLISH ELECTRIC CO., LTD., Liverpool. H.N.C. electrical and drawing office experience are essential qualifications. Write, quoting ref. No. 443F, to Dept. C.P.S., 336/7 Strand, W.C.2. (H 3)

INFORMATION OFFICER required to assist in technical information service for research, engineering and commercial departments of a large electrical engineering firm in the north-west. Technical qualifications in engineering essential. Previous experience in industrial information work and a knowledge of French or German would be advantageous. Salary will depend on qualifications and experience and will be progressive. Write giving full particulars including age, sex, nationality, education and experience, marking envelope "Information Officer," to—Box No. 3366, Electrical Times. (H 156)

LABORATORY ENGINEER. Required by a fast expanding firm in Stevenage, LABORATORY ENGINEER, B.SC. OR H.N.C. standard for work on interesting project involving servo control with magnetic amplifiers. Experimental ability and flair for design essential. Experience with magnetic amplifiers very desirable. The post is progressive. Housing and Pension scheme available. Write Box No. 3353, Electrical Times. (H 125)

LABORATORY ENGINEER. Required by a fast expanding firm in Stevenage, LABORATORY ENGINEER, B.SC. OR H.N.C. standard for work on electromagnetic devices, relays and solenoids. Must have experimental ability and flair for design. Experience with electro magnetic devices essential. The post is progressive. Housing and Pension Scheme available. Write—Box No. 3355, Electrical Times. (H 126)

LEADING Domestic Appliance Manufacturer requires a SALES EXECUTIVE, not more than 40 years of age, resident in Devon.

Qualifications: Good education and appearance. Able to drive. Previous sales experience and good administrative ability. Substantial basic salary, commission and expenses. Full details to—Box No. 3375, Electrical Times. (H 172)

MECHANICAL DRAUGHTSMAN wanted for factory in West Midlands. Permanent and pensionable post, attractive working conditions. Maximum salary approximately £730 p.a. Experience of design of malleable castings an advantage. Apply giving particulars of age, qualifications and experience to—Box No. 3377, Electrical Times. (H 173)

MECHANICAL ENGINEER with good technical qualifications required for 80 MW industrial power station. Age not less than thirty. Commencing salary £950 to £1,100. Non-contributory pension scheme. Up-to-date power station experience essential. Apply in writing to Salaried Personnel Department, Ford Motor Company Limited, Dagenham, Essex, quoting reference TME/9. (H 42)

OLD established industrial undertaking in N.W. England requires ELECTRICAL ENGINEER, experienced in power and lighting installations, high and low voltage, automatic control equipment and instrumentation. Please give full particulars of training, experience and present salary to—Box No. 3363, Electrical Times. (H 132)

OVERHEAD LINE ENGINEER required by Consulting Engineers for supervision of work in North Scotland and Outer Islands. Applicants should have had experience in the design and construction of overhead lines up to 33 kV. Salary according to experience.

Applications together with details of education, training and experience should be sent to Messrs KENNEDY AND DONKIN, 3 North Charlotte St, Edinburgh 2. (H 157)

QUALIFIED ELECTRICAL ENGINEER required to participate in development and testing work on cables. Some experience on cable test at audio and carrier frequencies desirable but not essential. This post is pensionable and carries a salary of £550 upwards in accordance with qualifications and experience. Details to: Staff Officer, THE TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD., Telcon Works, Greenwich, S.E.10. (H 127)

REPRESENTATIVE required by well established manufacturers of high grade switches to cover Northern Counties. Contact with Area Boards and leading industrial organisations an advantage and one or two other agencies in electrical line not objected to. Reply giving full details including experience and remuneration expected to—Box No. 3347, Electrical Times. (H 118)

REPRESENTATIVE WANTED by leading Electrical Repair Company. London area.—Box No. 3287, Electrical Times. (H 32)

REPRESENTATIVE. Really first class man needed for London and Home Counties by Electrical Appliance Manufacturer whose products are sold mainly through Wholesalers and Electricity Boards. Preference will be given to applicant with experience in a similar capacity. Remuneration by salary and commission. The successful applicant will have to provide his own car for which generous expenses will be allowed.

Applications which will be treated in strict confidence must give full particulars.—Box No. 3369, Electrical Times. (H 158)

SENIOR TECHNICAL ASSISTANT to the Sales Manager is required by Manchester Manufacturers, whose products are widely employed by the electrical industry both home and overseas. The person appointed will assist in the general supervision and direction of the inside and outside Sales staff, liaison with Works and Research Departments, development and marketing of new products and contact with senior executives of purchasers and overseas agents.

The position calls for a high standard of commercial ability, energy, tact, and initiative, and some knowledge of synthetic resins and laminates would be an advantage. It offers an initial salary full commensurate with qualifications and experience, favourable pension scheme and excellent prospects.

Applications are invited from engineers, age about 35, having a broad commercial experience and recognised technical qualifications and practical training.

Please give full details of training, experience and order of salary required to—Box No. 3333, Electrical Times. (H 65)

THE GENERAL ELECTRIC CO., LTD., invite applications from suitably qualified men aged 25—30 for technical work in Space Heating and Industrial Cooking. Applicants should possess an Ordinary National Certificate—preferably H.N.C.—and have had some previous experience in this or associated fields. These positions in the Head Office of the Company's Sales Organisation, carry a good commencing salary and prospects. Apply in writing quoting reference I.H. to the Staff Manager, Magnet House, Kingsway, W.C.2. (H 105)

TECHNICAL ASSISTANT required for Export Sales Department of West London Instrument Manufacturers. Higher National Certificate standard. Some knowledge of foreign languages preferable but not essential. Write giving particulars of education, experience and salary required.—Box No. 3351, Electrical Times. (H 121)

THE TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD., require:

1. GRADUATE ELECTRICAL ENGINEER or PHYSICIST to work on the development of polythene insulated high voltage cables. This will include developing suitable testing methods and equipment. Direct or relevant experience in these fields desirable.
2. Qualified ELECTRICAL ENGINEER to work on the design of cable fittings. The work involves the development of fittings for polythene insulated high voltage cables. Practical experience of cable accessories desirable.

These posts are pensionable and carry salaries of £550/£600 upwards. Details to Staff Officer, Telcon Works, Greenwich, S.E.10. (H 128)

THE ASSOCIATED ETHYL COMPANY LIMITED, Northwich, Cheshire, wish to appoint to their Engineering Department two ASSISTANT ELECTRICAL ENGINEERS. One appointment will be to the Design and Engineering Section and one to the Works Maintenance Section.

Applicants for position (1) should be between 30 and 40 years of age and have had not less than ten years' professional experience in the fields of electrical design operation and maintenance, as practised in heavy chemical or petroleum processes. Special attention will be paid to applicants having experience in heavy current electrolytic processes.

Applicants for position (2) should be between 25 and 35 years of age and have had not less than five years' experience in the organisation and control of electrical maintenance in a heavy chemical plant.

Position (1) will be located initially at Northwich, Cheshire, and ultimately at Ellesmere Port, Cheshire.

Position (2) will be located at Northwich, Cheshire.

Applications stating age, experience and qualifications should be made to the Deputy Manager—Personnel, at the above address. (H 171)

WANTED by firm of Electrical and Mechanical Engineers in Lancashire, Manager for their Electrical Installation department. Must be capable of designing, estimating and supervising all types of installation. Please give details of experience and salary required.—Box No. 3317, Electrical Times. (H 41)

YOUNG ELECTRICAL ENGINEER required for supervising lighting and power installations, preferably with breakdown knowledge. Write, stating previous experience, age, and salary required, to—Box No. 3359, Electrical Times. (H 130)

WANTED: SENIOR FOREMAN
Must be capable of taking charge of large contracts in Town and Country. Must hold E.T.U. Ticket.
Write giving full particulars to:
RASHLEIGH PHIPPS & CO., LTD.
Electrical Engineers,
Esmond Court, Thackeray St,
Kensington, W.8. (H 123)

WANTED: COSTING CLERK
Required, able to prepare accounts for contracts, previous similar experience essential, Write full particulars and salary required to:
RASHLEIGH PHIPPS & CO., LTD.
Electrical Engineers,
Esmond Court, Thackeray St,
Kensington, W.8. (H 124)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2.

AN old established Company in South-East London has a vacancy for an experienced ENGINEER as Senior Assistant to the Head of the development department. Experience of the design of A.C. and D.C. machines up to 50 kW and also of small electromechanical devices is required. Some knowledge of electronics would be an advantage. This position is one of exceptional possibilities for the right man. A University degree and corporate membership of the Institution of Electrical Engineers is essential. Reply giving details of experience, age and salary required to Personnel Manager, Box 2V D.1637, A.K. Advg., 212a Shaftesbury Ave, London, W.C.2. (H 117)

WANTED

WANTED. ROTARY CONVERTERS, any size.—Universal, 221 City Rd, London, E.C.1. (H 14)

WANTED, D.C. and A.C. ball-bearing MOTORS, MOTOR GENERATOR SETS, DYNAMOS and ALTERNATORS.—Full details to Britannia Manufacturing Co., Ltd., 22-26, Britannia Walk, London, N.1. (H 12)

WANTED, for prompt cash, ferrous and non-ferrous SCRAP; also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. and H. Cooper Ltd., 176 Brady St, Bethnal Green, E.1. (H 10)

WANTED. Up to 20 Sprague Vitamin Q Capacitors, 0·05 Microfarad, 16,000 Volts D.C. Single Terminal Type. B.I.C.C. LTD., Buying Department, Erith Works, Belvedere, Kent. (H 111)

WORK WANTED

A.C. and D.C. MOTOR REWINDS and REPAIRS. Prompt service fully guaranteed. Edgware 5566 (4 lines).—Service Electric Co., Ltd., Stanmore, Middx. (H 20)

ARMATURE REWINDING service to the trade. Vacuums, Drills, Grinders, Hood Dryers, Dental Motors. Vacuum cleaner and drill armatures replaced from stock 24-hour service. Every job guaranteed. All vacuum cleaner parts, hoses, etc., in stock for any make. Apex washer agitator shafts stocked.—Regam Electric Cleaner Service, 95 Park Lane, Leeds 1. (H 25)

FISHER FOUNDRIES LTD., Greet, Birmingham 11, for Machine Moulded Precision Castings in gun metal and soft grey iron. Telephone: Birmingham Victoria 0197. (H 53)

WORK WANTED. Capacity available for all types of COIL WINDING.—Box No. 2425, Electrical Times. (H 23)

FOR SALE

A.A. ELECTRICAL CO. for A.C.-D.C. MOTORS, SWITCHGEAR, EXHAUST FANS, HOISTS, REDUCTION GEARS, new or reconditioned units.—Chi 5105, 67 Rothschild Rd, W.4. (H 15)

A.C. and D.C. MOTORS, all sizes, large stocks. Fully guaranteed.—Milo Engineering Works Ltd., Milo Rd, East Dulwich, S.E.22 (Forest Hill 2278-9). (H 11)

A.C.-D.C. QUARTERLY and SLOT.—Brent Electrical Co., 6 Holmdale Gardens, London, N.W.4. (H 13)

A.C. and D.C. MOTORS, GENERATORS from stock.—Service Electric Co., Ltd., Honeypot Lane, Stanmore, Middx. Edgware 5566-9. (H 16)

A HIGH VACUUM IMPREGNATION UNIT or single or batch coil impregnation service to R.I.C. Specification 214 or individual requirements. — Blickvac, 505 Lordship Lane, S.E.22. Tel.: Forest Hill 7089. (H 24)

CABLE/FLEX much cheaper in odd length coils. Short lengths supplied. Lists. BDC, 591 Green Lanes, London, N.8. (H 37)

DON'T worry about your electricity bills. Fit 1s. slot electric meters for hotels, bed-sitters, etc. Prices from 50s.—Selectrics, Department E.T., Castle Circus House, Torquay. Tel. 7218. Trade inquiries invited. Trade discount. (H 26)

DAVID-BROWN, Croft, Neco and other makes of Reduction Gears and Reduction Geared Motor Units. For detailed list with prices, apply: WHITEFIELD MACHINERY AND PLANT LTD., Cobden St, Pendleton, Salford 6. (H 35)

FLAMEPROOF MOTORS, M.G. SETS, D.C. MOTORS, GEARED MOTORS, A.C. MOTORS, TRANSFORMERS, CONTROL GEAR. SPECIALS. FLANGE MOTORS

ELECTROPOWER COMPANY LIMITED

Kingsbury Works, Kingsbury Rd, London, N.W.9

Tel.: COLindale 4621/3,

Grams: Lectropowa, Hyde, London (HI9p)

ELECTRIC MOTORS for 400/3/50 with Control Gear.

290 h.p. synchronous Verity, B.R.B. Direct coupled exciter. Screen protected. Speed 750 r.p.m.

260 h.p. S/R induction Mather and Platt, pipe ventilated frame, B.R.B. Speed 587 r.p.m.

200 h.p. S/R induction Harding and Churton, protected frame, B.R.B. Speed 725 r.p.m.

175 h.p. S/R induction B.T.H., protected frame with R.C.B. Speed 480 r.p.m.

105 h.p. S/R induction Mather and Platt, B.R.B. Speed 960 r.p.m.

100 h.p. S/R induction Brook, protected frame with endshield, B.R.B. Speed 1,440 r.p.m.

95 h.p. S/R induction Met-Vick., totally encl. fan cooled, endshield, B.R.B. Speed 735 r.p.m.

80 h.p. S/R induction Crompton Parkinson, totally enclosed, endshield, B.R.B. Speed 1,475 r.p.m.

60 h.p. S/R induction L.S.E., screen protected frame, Speed 968 r.p.m.

50 h.p. S/R Met.-Vick. totally enclosed, surface cooled. Speed 730 r.p.m.

THREE—50 h.p. S/R induction L.S.E., screen protected frames, endshield, B.R.B. Speed 1,440 r.p.m.

THREE—47½ h.p. S/R induction L.D.C. Speed 730 r.p.m.

40 h.p. S/R induction L.D.C. Speed 735 r.p.m. George Cohen Sons and Co., Ltd., Wood Lane, London, W.12. Tel.: Shepherd's Bush 2070 and Stanningley, nr. Leeds, Tel.: Pudsey 2241. (H 98)

GENERATING Plant comprising two 70 h.p. cold start Pelapone Diesel Engines coupled to two English Electric AC 440 3-phase Alternators complete with Batteries and Switchboard, all in first class order. PETER, BOGENGARRIE, MINTLAW, Aberdeenshire. (H 161)

G.E.C. Floodlights designed to give the very best possible light distribution for the purpose. Size 28 in. x 20 in. mounted in wrought iron adjustable cradle, fitted Phillips Sodium Discharge Lamp 200/250 V, 140 W, a.c. supplies.

Designed for illuminating the front of Service Stations, hotels and internal lighting, etc. Actual value £90. Our Price £35 Carriage extra. Marble Arch Motor Supplies Ltd., 286 Camberwell Rd, London, S.E.5. Tel.: ROD 2181. (H 56)

METERS reconditioned, all types, quarterly credit single and three-phase 3/4-wire. 2½/100 amp. Prepayment AC/DC single, dual, triple coin, fixed or variable tariff. 2½/50 amp. Delivery ex-stock, guaranteed, free catalogue lists 200 types. The Electric Meter Company, Department ET46, Castle Circus Hse, Torquay.

Don't forget reconditioned meters are supplied by The Electric Meter Company, Department ET46, Castle Circus Hse, Torquay. (H 92)

HOUSE-SERVICE METERS, a.c. or d.c., quarterly or prepayment.—Universal Electrical, 221 City Rd, London, E.C.1. (H 17)

MERCURY SWITCHES are made by Hall, Drysdale and Co., Ltd., of 58 Commerce Rd, Wood Green, London, N.22. Tel.: BOW. 7221. (H 18)

MERCURY Arc Glass Bulb RECTIFIER by Hewittic. Input 400 volts, 3-phase, 50 cycles. Output 440 volts D.C., 126 kW. Apply to: Whitefield Machinery and Plant Ltd., Cobden St, Salford, 6. Tel. PEN 1373/4. (H 45)

OVER 1,000,000 2BA Simmonds and Aerotight Lock Nuts offered in new condition at less than half price. 12s. 6d. per 1,000 in lots of over 10,000. Ex works. UNIPRODUCTS (Manchester) Ltd., 136 Bolton Rd, Salford, 6. (H 162)

ONE B.I.C. type QM.63. 10 kVA Spot Welding Machine, complete with Automatic Time Control Unit.—Box No. 3315, Electrical Times. (H 40)

PURLEY CHOKES AND BALLASTS. Our 80-W tapped h.p.f. ballast with starter switchgear-holder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. E.T.), Purley, Surrey. Uplands 4818-9. (H 21)

TIME SWITCHES for sale. Reconditioned or new. 12 months' guarantee. Immediate delivery. Lists from: J. W. Hughes, 3 St. Thomas' St, London Bridge, S.E.1. (Tel.: HOP 2759.) (H 27)

1½ IN. Electrical Conduit Tubing, 9,000 ft available, new but store soiled. Offered at £5. per 100 ft ex works. Usual price 143s. Any reasonable quantity supplied. UNIPRODUCTS (Manchester) Ltd., 136 Bolton Rd, Salford 6. (H 163)

4,000 YARDS P.I.L.C., S.W.A. and S. Cable. 600 V. 3-core. ·0045 sq in. on 4 drums. Good condition. £150 per 1,000 yd. —Apply Box No. 3371, Electrical Times. (H 160)

25 KVA, Westinghouse, Oil transformers, 11,000 V to 400/3/50. Tap changes. New. 12 available for immediate delivery. JOHN PHILLIPS AND CO., LTD., India Pavilion, Wembley. (H 176)

BUSINESS OPPORTUNITIES

ELECTRICAL CONTRACTORS with good showroom facilities, for sale. Mddx.—Box No. 3379, Electrical Times. (H 177)

AGENCIES

AGENT required for Lancashire and Yorkshire area. Must have good personality and knowledge of electric motors up to 10 h.p., and their application. Retainer and commission. Please write to Sales Manager, SMALL ELECTRIC MOTORS LTD., Churchfields Rd, Beckenham, Kent. (H 61)

"BORNEO—STATE OF BRUNEI." An Electrical Engineering Company undertaking installation contracts and servicing and maintenance as well as sales and distribution, under complete European management and supervision, is open to accept agencies in Brunei, Sarawak, and British North Borneo. This is a rapidly expanding area with considerable scope for an export trade. P.O. Box 80, Kaula Belait, State of Brunei, Borneo. (H 48)

THE NELSON ENGINEERING CO., LTD., are desirous of appointing agents for the sale of their products in all main industrial areas in the United Kingdom. We are exhibiting at the ASSOCIATION of SUPERVISING ELECTRICAL ENGINEERS Exhibition to be held at EARLS COURT from 16 to 20 Mar. inclusive, a selective range of our products. Interested parties are invited to contact our representatives on stand No. 95. (H 164)

INDEX TO ADVERTISERS

Alton Battery Co., Ltd. 4
Aluminium Wire & Cable Co., Ltd. ... 1
Arrow Electric Switches Ltd. 3
Ashdowns Ltd. 88
Astral Equipment Ltd. 84

Backer Electric Co., Ltd. 40
Benjamin Electric Ltd. 69
B.B. Chemical Co., Ltd. 20
Bill Switchgear Ltd. 5
Birmingham Aluminium Casting (1903) Co., Ltd. 31
Bray, George, & Co., Ltd. 24
Brayhead Springs Ltd. 56
British Electric Resistance Co., Ltd. ... 84
British Electrical Repairs Ltd. 14
British Electricity Authority 13
British Insulated Callender's Cables Ltd. 27
British Thomson-Houston Co., Ltd. 65, Cover (iv)
Brookhirst Switchgear Ltd. 43
Brush Electrical Engineering Co., Ltd.... 12
Bryce Electric Construction Co., Ltd. 57
Burco Ltd. 64
Butcher, J. H., & Co., Ltd. 34

Castell Locks Ltd. 94
Castle Engineering Co. (Nottingham), Ltd. 50
Channel Conduits Ltd. 94
Chilton Electric Products Ltd. 19
Cole, E. K., Ltd. 46
Connollys (Blackley) Ltd. 47
Cox Walkers Ltd. 88
Cressall Manufacturing Co., Ltd. ... 83
Crompton Parkinson Ltd. ... 21, 91

Danfoss Manufacturing Co. 45
"Diamond H" Switches Ltd. 86

East London Mica Works 92
Edison Swan Electric Co., Ltd.... ... 62
E. F. Electric Ltd.... 71
Ekco-Ensign Electric Ltd. 16
Electrical Times Ltd. 89, 94
Electro Methods Ltd. 46
Ellison, George, Ltd. 67
E.M.S. Electrical Products Ltd.... ... 6
Enfield Cables Ltd. 70
English Electric Co., Ltd. ... 59, 87
Erskine Heap & Co., Ltd. 49

Falk, Stadelmann & Co., Ltd. 15
Ferguson Pailin Ltd. 97
Ferranti Ltd. 51
Fibreglass Ltd. 93
Follsain-Wycliffe Foundries Ltd. ... 48
Fry's Metal Foundries Ltd. 53

General Cable Manufacturing Co., Ltd. 74
General Electric Co., Ltd. 68, 85, Cover (i)
Green, E., & Son Ltd. 26
Grelco Ltd. 92

Hackbridge Cable Co., Ltd. 57
Harboro' Rubber Co., Ltd. 82
Heatrae Ltd. 9
Hedin Ltd. 72
Henley's, W. T., Telegraph Works Co., Ltd. 73
Hercules Powder Co., Ltd. 95
Heyes & Co., Ltd. 34
Higgs Motors Ltd. 10
Holman, Michell & Co., Ltd. 86
Howden, James, & Co., Ltd. 18

Igranic Electric Co., Ltd. 7
Imperial Chemical Industries Ltd. ... 28

Johnson & Phillips Ltd. 37

Kelly, John, & Son 96
Kent Bros. Electric Wire Co., & E. H. Phillips, Ltd. 50
Kersons Manufacturing Co., Ltd. ... 8
Kleenoff Co. 92

Loheat Ltd. 92

McKechnie Brothers Ltd. 56
Marryat & Place Ltd. 71
Martindale Electric Co., Ltd. 24
Mersey Cable Works Ltd. 98
Metropolitan-Vickers Electrical Co., Ltd. 54
Midland Electric Manufacturing Co., Ltd. 70
Mitchell Engineering Ltd. 41
Morley's Electrical Services Ltd. ... 60

Nalder Bros. & Thompson Ltd. ... 11
Nettle Accessories Ltd. 29
New Switchgear Construction Co., Ltd. 60

Parmiter Hope & Sugden Ltd.... Cover (iii)
Partridge, Wilson & Co., Ltd. 63
Pilkington Bros. Ltd. 25
Pitman, Sir Isaac, and Sons Ltd.... ... 40
Pyrotenax Ltd. 61

Rawlplug Co., Ltd. 6
Record Electrical Co., Ltd. 32
Renfrew Foundries Ltd.... 35
Resistances Ltd. 34
Reyrolle, A., & Co., Ltd.... 30
Rheostatic Co., Ltd. 52
Rowlands Electrical Accessories Ltd. ... 66

Saxonia Electrical Wire Co., Ltd. ... 94
Scottish Cables Ltd. 23
Shell Mex & B.P. Ltd. 2
Sigmund Pumps Ltd. 22
Simmonds & Stokes (Niphan) Ltd. ... 24
Simplex Electric Co., Ltd. ... Cover (ii)
Simon-Carves Ltd. 17
Small Electric Motors Ltd. 20
Smart & Brown (Engineers) Ltd. ... 96
Smiths Industrial Instruments Ltd. ... 56
Standard Telephones & Cables Ltd. ... 33
Stanhope Box Co., Ltd. 96
Sturdy Electric Co., Ltd. 40
Sunvic Controls Ltd. 36
Sutcliffe Speakman & Co., Ltd.... ... 90

Thermodare (Great Britain) 69
Thorpe, F. W., Ltd. 64
Three-Ply Box Co., Ltd.... 96
T. M. C.-Harwell (Sales) Ltd. 42
Tok Electrical & Industrial Mechanisms Ltd. 12
Tucker, J. H., & Co., Ltd. 58

Volex Electrical Products Ltd.... ... 44

Wandleside Cable Works Ltd.... ... 39
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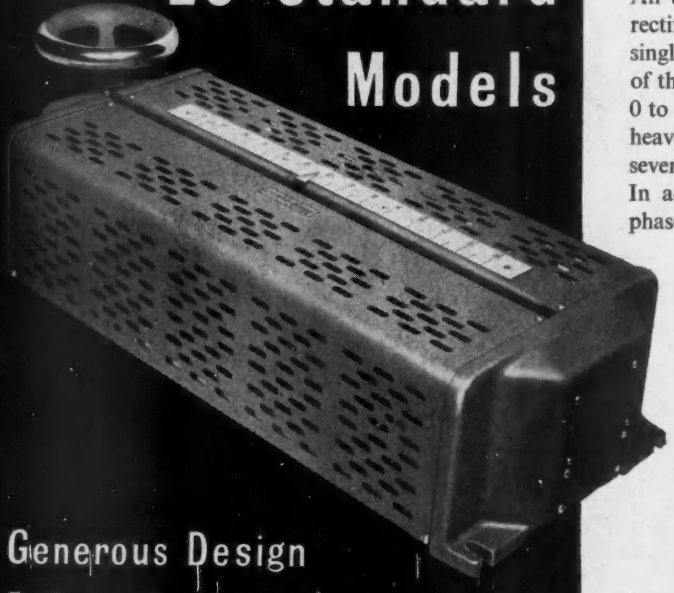

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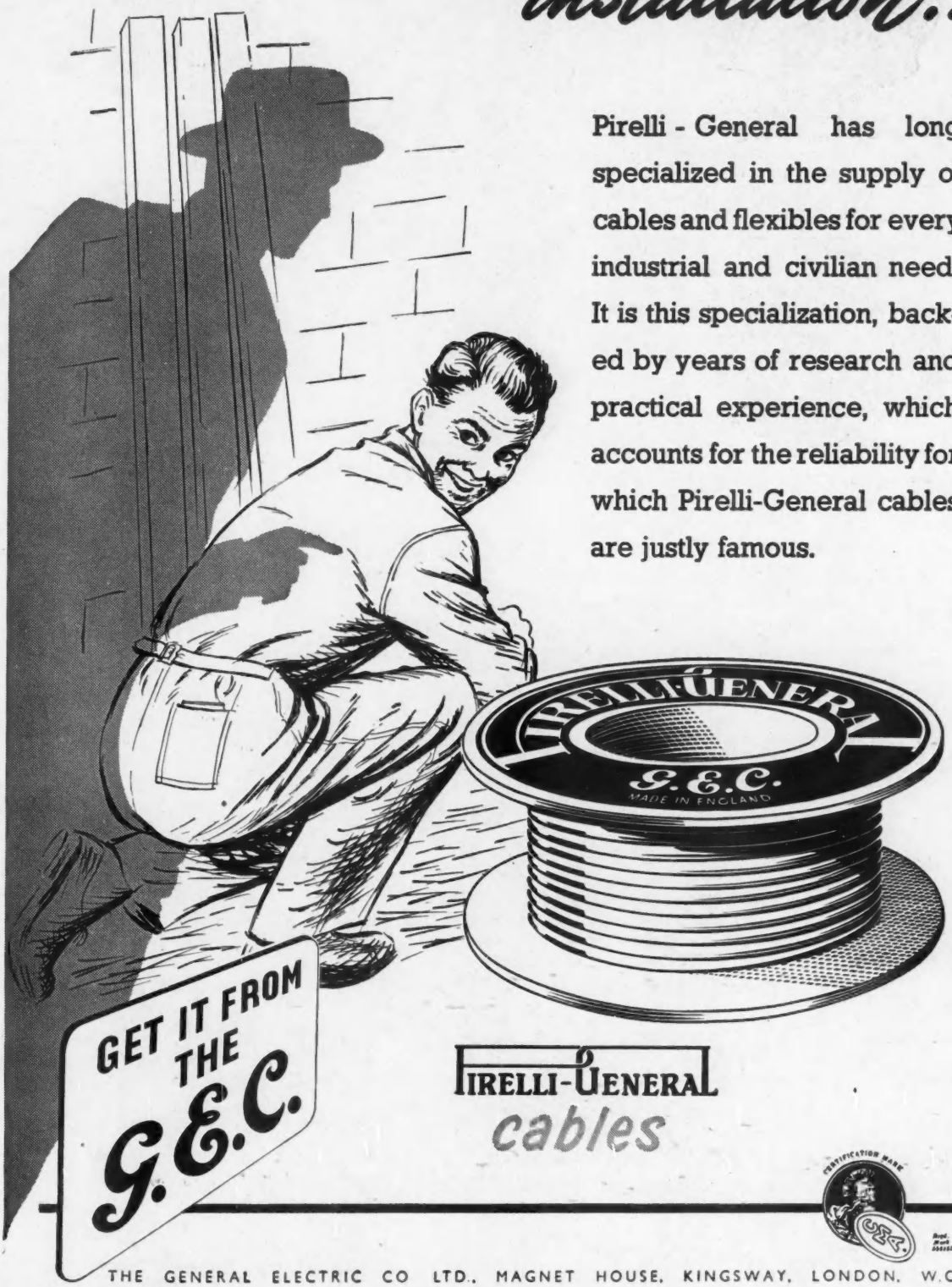

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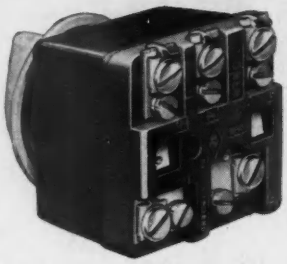

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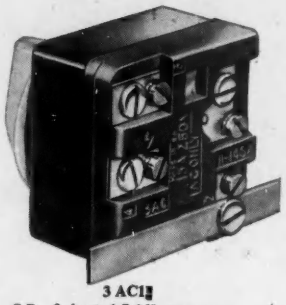

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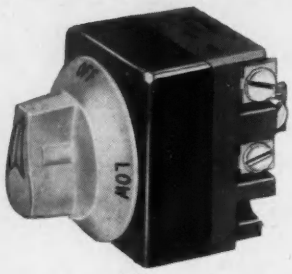

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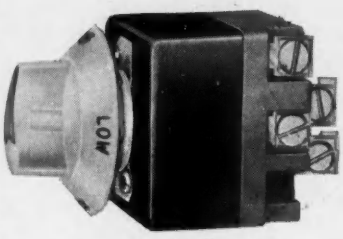

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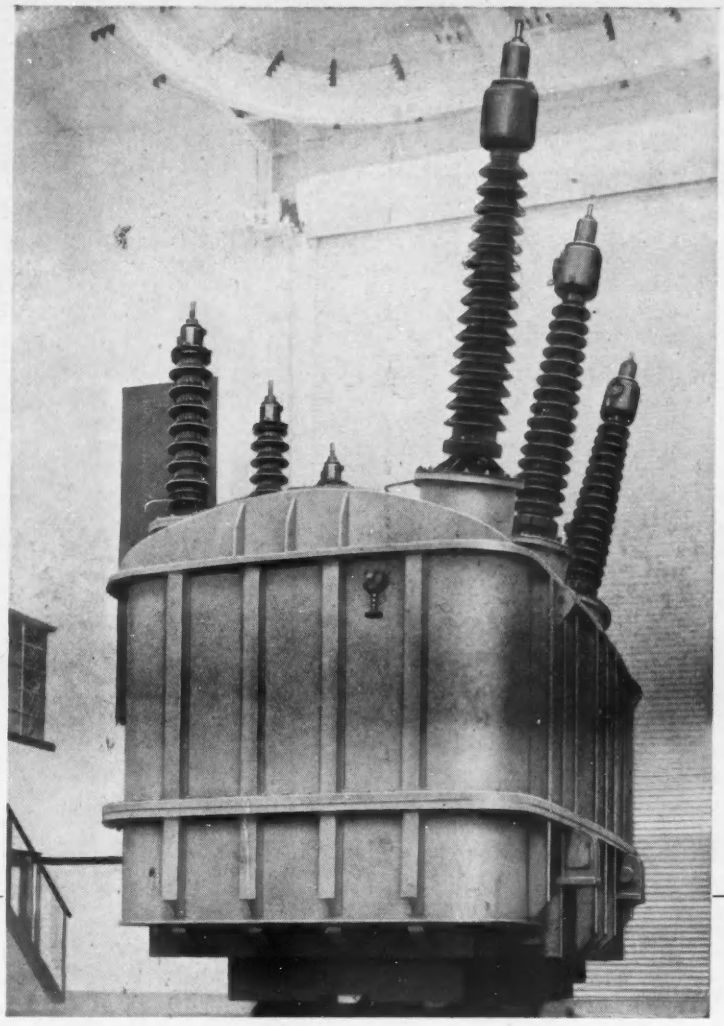

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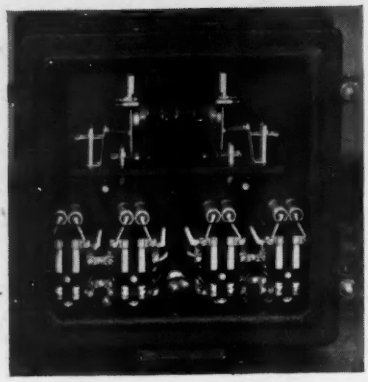

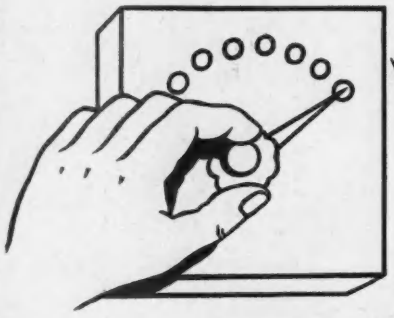

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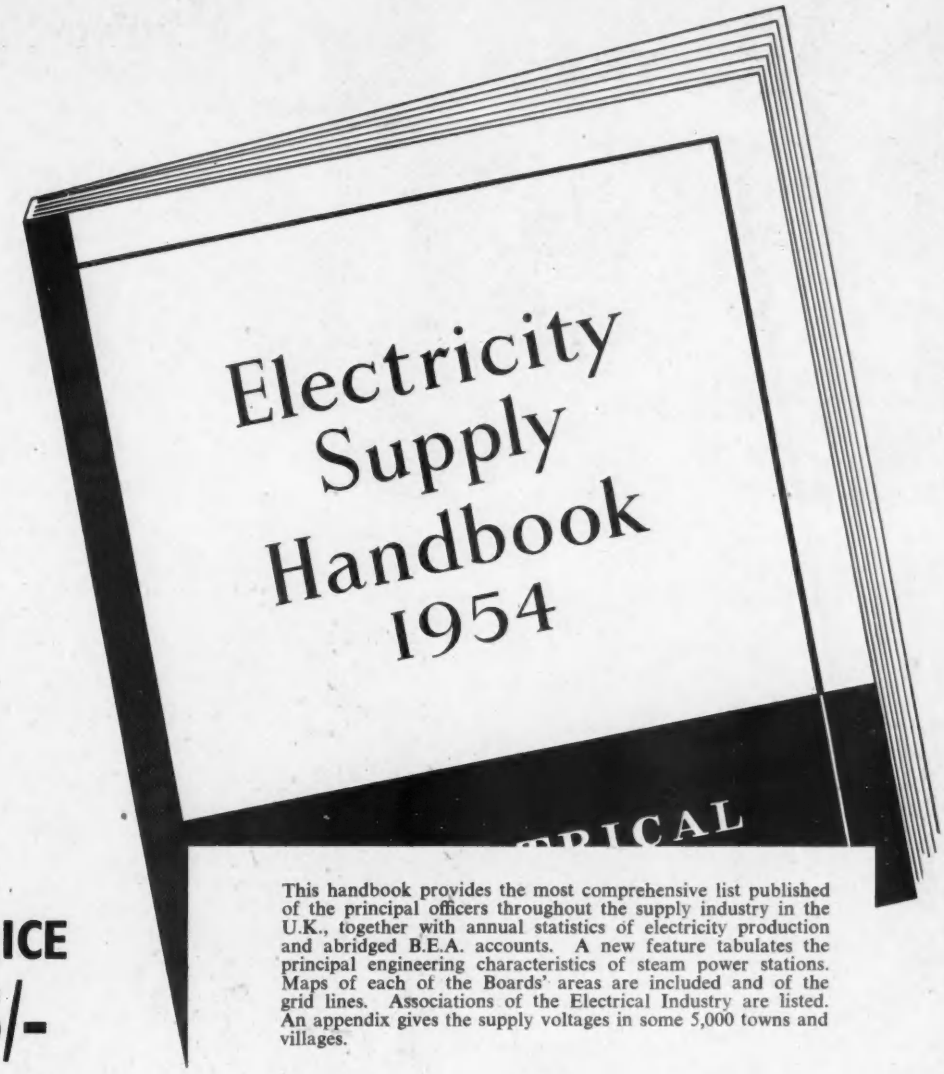

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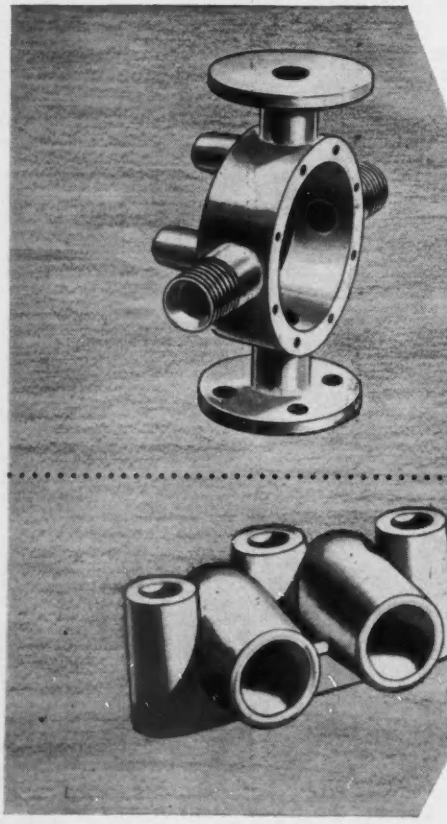

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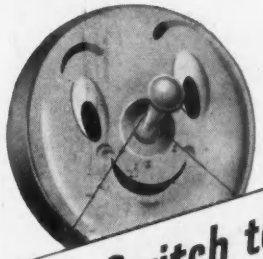

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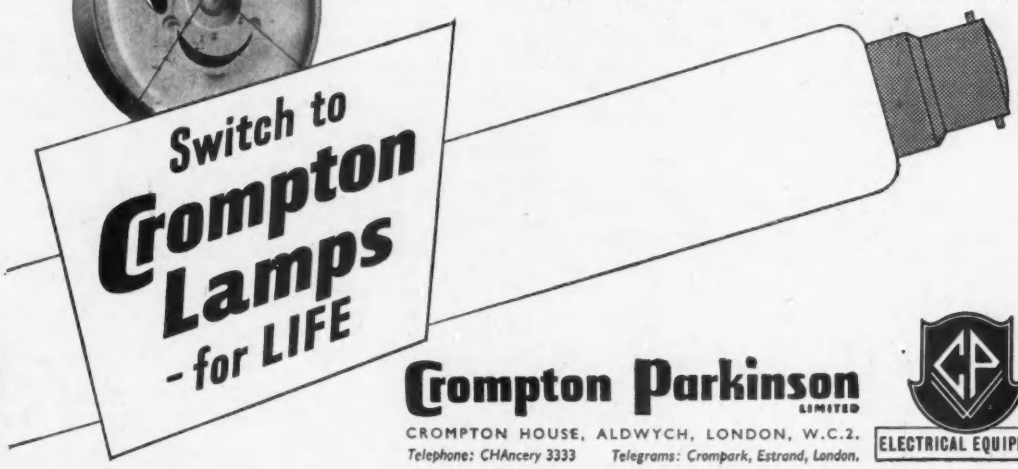

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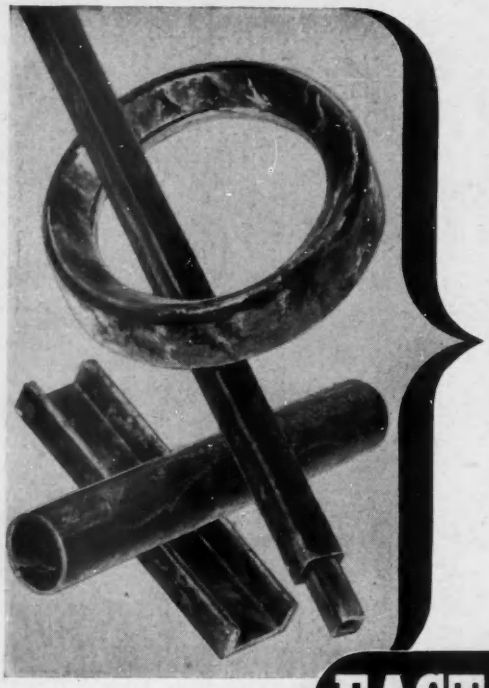

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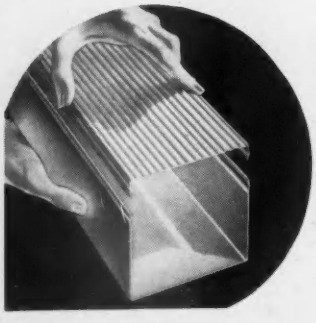

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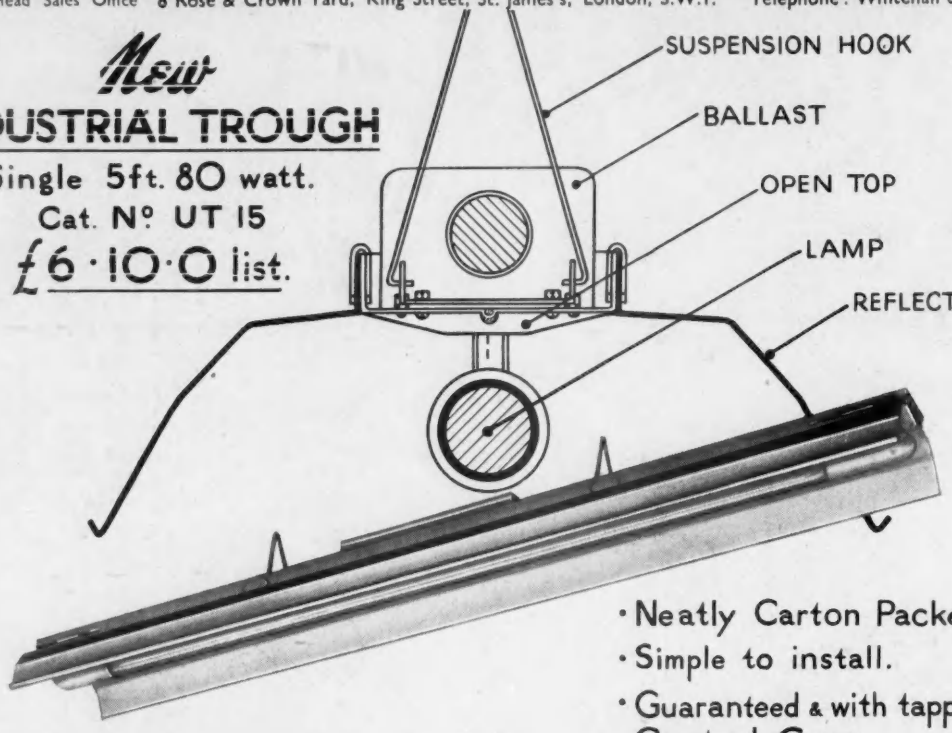

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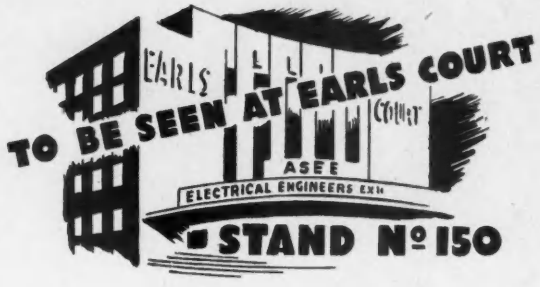

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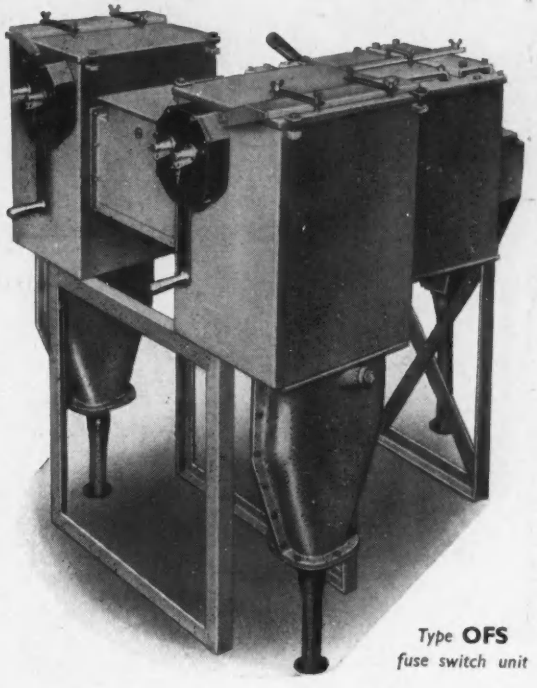
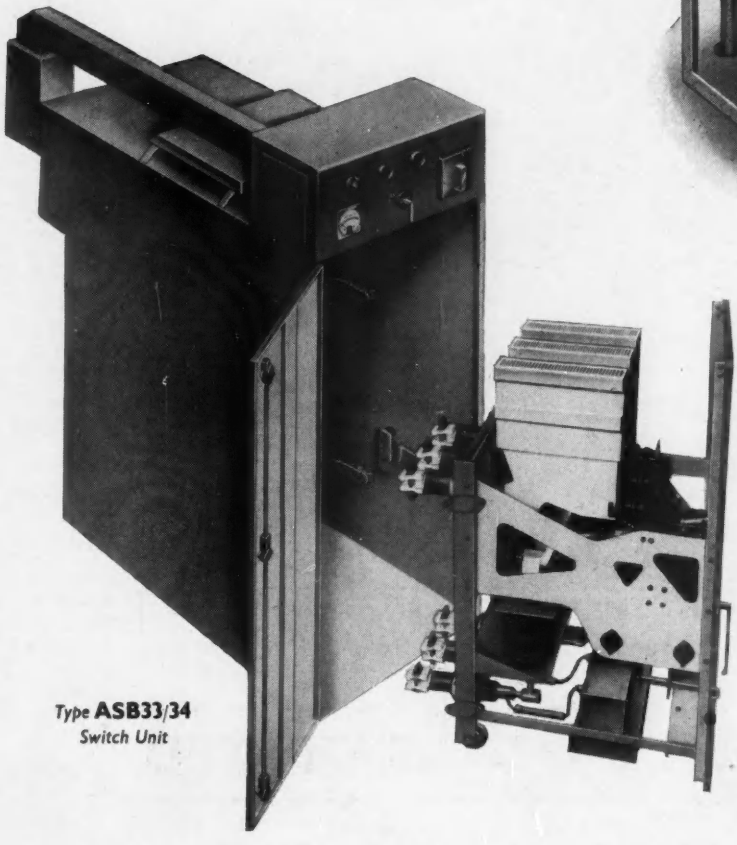


Type **OFS**
fuse switch unit



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The type OFS oil immersed fuse switch is a multi-purpose unit with the outstanding feature of economy in cost.
Among other features of importance is its small space requirement—a good point where available space is limited.
These fuse switches can be mounted individually, assembled to form a switchboard, or used in conjunction with IB3 oil switches to form a composite unit, which may be either extensible or non-extensible. This latter arrangement is particularly suitable for the control and protection of sub-circuits teed off an 11 kV or lower voltage ring main.

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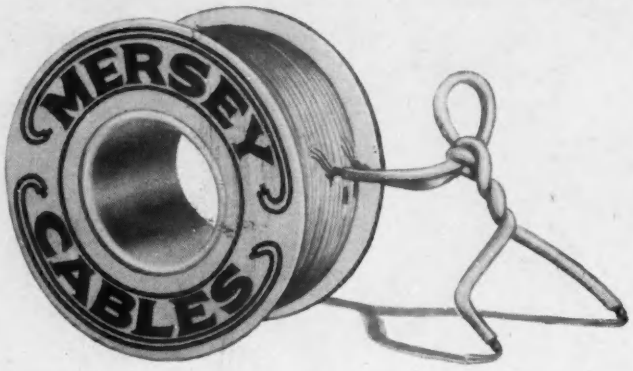

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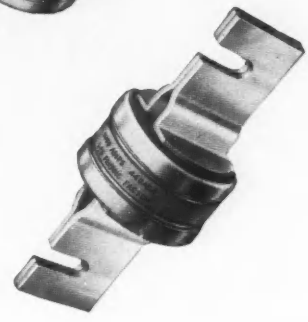

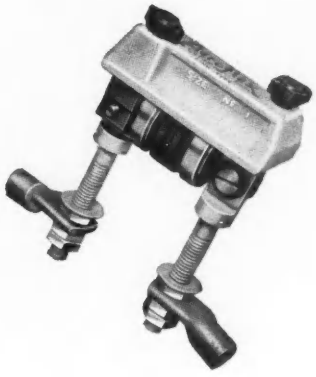

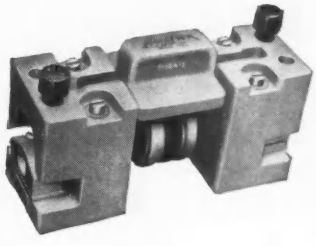

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